

PLUTONIA

V.A. OBRUCHEV



After resting they drifted further down the river.

PLUTONIA

An Adventure through Prehistory

by

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FOREWORD

OUR Earth has existed for many millions of years, during which life on its surface has undergone great changes. The clots of albumen formed in the warm water of the primeval seas gradually became more complex and evolved into a number of vegetable and animal organisms of diverse kinds which in the course of countless generations attained the state in which we know them today.

We can trace this change in the forms of organic life by studying the remains of past forms preserved as fossils in the Earth's crust; these enable us to form a fairly complete idea of the plants and animals which lived on the surface of the Earth during the "geological periods", eleven in number, which have succeeded one another since organic life first arose. The further a particular period from the present day, the greater the difference between the forms of its organic life and those we know today.

The study of these past forms of life, their characteristics, the conditions of their existence and the reasons for the changes they underwent, some dying out while others developed and improved, is the task of the branch of science called paleontology. It is a subject studied in a number of higher schools; but apart from scholars most people are interested in knowing something of the forms and conditions of life in the past. I have tried to cater for this general interest by writing this little book in the form of a science-fiction novel. I could have described how men find impressions made by plants on slabs of stone, and how they build up a picture of an entire tree or bush from individual leaves; how they extract shells, corals and remains of other marine invertebrates from the rocks, clean them and decide what to call them; how, taking tremendous precautions, they dig up the bones of vertebrate animals and reconstruct whole skeletons from which they judge what the creatures must have looked like. But such descriptions would be long and tedious and only suitable for study by budding paleontologists; to the general reader they would give a very pale notion of earlier

forms of life. And so I chose the medium of a novel. But how was I to introduce the reader to that world of long-extinct beings?

I know of only two novels in which such an attempt has been made. One is Jules Verne's novel, *A Journey to the Centre of the Earth*, in which some scientists descend into the bowels of the earth through the crater of a volcano in Iceland and discover subterranean voids inhabited by mysterious beings and extinct animals, which are described rather vaguely. On their way back the scientists come out to the surface through the crater of another volcano, on a raft which drifts through boiling water, and even across molten lava. All this is far from plausible. The crater of a volcano is not an open tube leading far into the depths; such craters are full of congealed lava, and it is not possible to float on a raft on boiling water—still less on molten lava. It was the geological mistakes in this novel that stimulated me in 1915 to write *Plutonia*. Until then I had written nothing for young readers and had had no intention of doing so.

The second book was Conan Doyle's novel¹ in which some explorers in South America come upon a high plateau, very difficult of access, cut off from the surrounding country and inhabited by primitive men, large anthropoid apes and various animals extinct in other parts of the Earth. The explorers climb up on to the plateau and have a number of adventures. However, there is a great deal that is unlikely in this novel too; it introduces the reader only to a world close to our own and it made so little impression on me that I have forgotten its title, though I read it twice and not very long ago, much later than I read Jules Verne's book.

A good science-fiction novel must be plausible; its reader must be convinced that all the events described could take place in certain circumstances, that there is nothing supernatural in them. If the novel is full of miracles of one sort and another then it is not a novel but a children's fairy-tale.

The original publication of the novel *Plutonia* showed me that it was plausible enough. I received numerous letters from readers quite seriously asking why fresh expeditions to Plutonia, to study the subterranean world, were not being fitted out. Others volunteered as members of future expeditions, or were concerned to know the subsequent fate of the explorers depicted

¹ i.e. *The Lost World* (Trans.).

in the novel. So I had to explain that in order to introduce extinct animals and plants as if they still existed in the bowels of the Earth, I had used a hypothesis advanced at the beginning of last century and at that time accepted seriously by scientists. This is expounded in the penultimate chapter (*A Scientific Discussion*) in which the organiser of the expedition maintains its correctness. In fact, this hypothesis has long since been refuted by science.

The author hopes that this edition of *Plutonia*, like previous ones, will stimulate young readers to learn more of the interesting science of geology which throws light on the composition and structure of our planet and tells us what plants and animals lived upon it in past times, and how they changed and succeeded one another, until from among the animals came forth the being that thinks—man, who has become the master of the Earth.

I

AN UNEXPECTED PROPOSAL

PROFESSOR KASHTANOV, famous for his travels in Novaya Zemlya and Spitsbergen and for his researches in the Arctic Ural region, and who occupied a university chair of geology, had just returned from his laboratory. The autumn term had ended, lectures and examinations were over, and the professor was musing pleasantly about the three-week winter vacation, but not as an opportunity for idleness, oh no! Still in his prime, strong and healthy, he intended only to take two or three days' rest and then to apply himself with a fresh mind to a scientific article he was writing on the geological relationship between the Urals and Novaya Zemlya.

While sitting at his desk waiting for dinner, Kashtanov looked at his day's post, glanced at some scientific pamphlets sent him by their authors, and ran through a catalogue of new books issued by a German publishing house. Finally his attention was caught by a big, yellowish envelope, with the address written in a small but very neat hand. . . .

The professor knew the handwriting of his regular correspondents very well, and this letter from an unknown person aroused his interest. He opened the envelope and with astonishment read the following lines:

Munku-Sardyk, 1.XII. 1913.

Dear Pyotr Ivanovich,—Knowing your experience in Arctic research and of your interest in the geology of the Arctic region, I invite you to take part in an expedition which I am sending out next spring to spend a year or two studying an unexplored part of the Arctic Ocean. If you agree in principle, please come to Moscow for a personal talk on January 2nd, 1914, in the afternoon, at the Hotel Metropole, where the other proposed members of the expedition and myself will be meeting. If you decide to refuse, please let me know, at the same address. Your travelling expenses will be paid whatever your decision.

Yours very truly,

Nikolai Innokentyevich Truhanov.

The professor put the letter down and pondered.

"Truhanov? I seem to have heard the name, but where and when? Something to do with geophysics or astronomy I think; I must find out. This is extremely interesting. He lives somewhere on the borders of Mongolia and is sending an expedition to the Arctic Ocean!"

Kashtanov reached for the telephone and called his colleague the professor of astronomy, who gave him the following information: Truhanov was a graduate of the university who had devoted himself to geophysics¹ and astronomy. He had not long before set up an observatory on the summit of Mount Munku-Sardyk, in the Sayan Range on the borders of Mongolia, to take advantage of the clarity of the air of Eastern Siberia during the long winters with their many cloudless days and nights. But what had the Arctic regions to do with this? The atmosphere over the Arctic Ocean was in any case less propitious for astronomical observations than that on Mount Munku-Sardyk. . . .

The astronomer could give no answer to this question, and there was nothing Kashtanov could do but resign himself to waiting to satisfy his curiosity until January 2nd. He had, of course, decided to go to Moscow.

II

MEETING IN MOSCOW

ON the afternoon of January 2nd, 1914, Professor Kashtanov drove to the Hotel Metropole and knocked on door 133, which the porter had told him was the one he wanted. The door was flung open and the professor found himself in a large, bright room where a number of men were already gathered. One of them came forward and, holding out his hand, exclaimed:

"You're as punctual as a clock, Pyotr Ivanovich, in spite

¹ Geophysics—the science of the physical make-up of the globe, its magnetic and electrical properties, the force of gravity, radioactivity, the temperature at great depths, the physical state of the interior of the Earth.

of this weather—a real Siberian blizzard! It's a good sign for our enterprise. I'm very glad you've come and to have the honour of receiving you. I'm Truhanov. Please let me introduce you."

The others came up one by one and made themselves known to Kashtanov:

"Semyon Semyonovich Papochkin. Zoologist and professor's assistant."

"Ivan Andreyevich Borovoy. Meteorologist at the Central Physical Observatory."

"Mihail Ignatyevich Gromeko. Botanist and doctor."

A large map of the Arctic region was spread on a table in the middle of the room, with the routes taken by the expeditions of the last fifty years marked on it in different colours. The land discovered by Vilkitsky so recently as the summer of 1913¹ was depicted, to the north of the Taimyr Peninsula.

When they were all seated round the table, Truhanov addressed them.

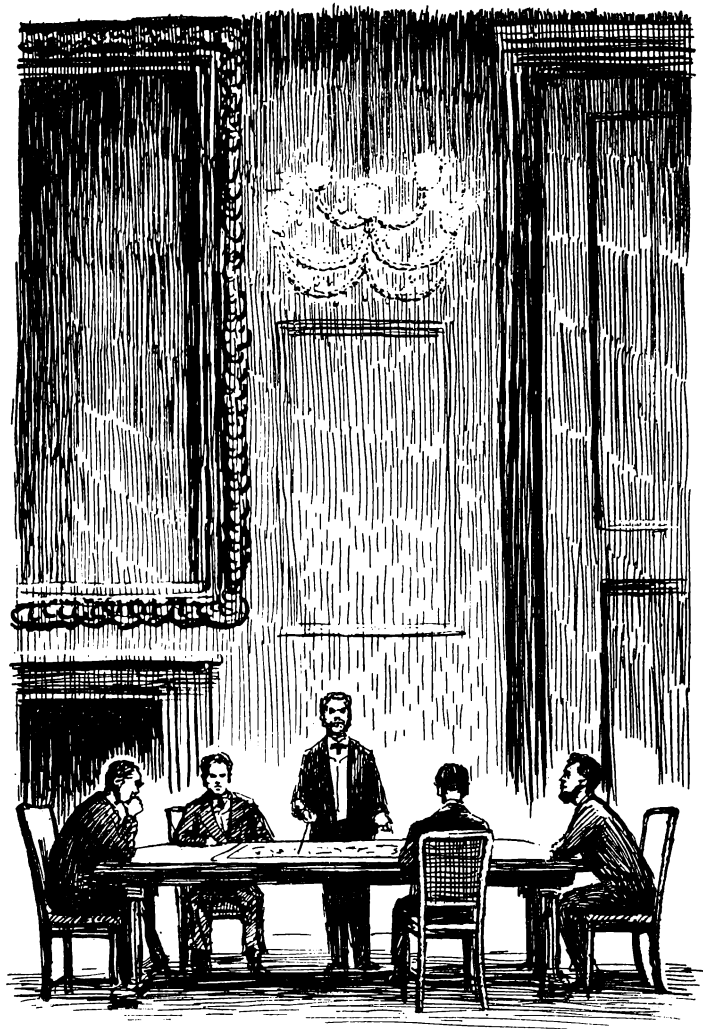
"As this map shows, five-sixths of the Arctic region, between Siberia, Northern Europe, Greenland and North America, is criss-crossed with the routes taken by numerous expeditions. But the discovery recently made by Vilkitsky has shown that even in this area great scientific achievements are still possible. One only has to direct one's efforts purposefully, making use of the experience of our predecessors.

"The work of the great expeditions of the seventeenth and eighteenth centuries, of Pronchishchev, Laptev, Dezhnev and Bering, and the investigations made by Wrangel and Middendorf in the nineteenth century in the Far North of Siberia, have been carried further in our own day by the expeditions of Sedov, Brusilov and Rusanov, exploring the Kara and Barents Seas. Vilkitsky has penetrated the same area and will, of course, continue with his investigations. I don't wish to compete with him. . . .

"My plans," Truhanov went on after a short pause, "concern another part of the Arctic region."

"Look at this big blank space to the north of the Chukot Peninsula and Alaska—not a single coloured line crosses it! The ill-starred ship *Jeannette*, caught in the ice, drifted to the south of this spot. The latest expeditions of Sverdrup and

¹ Now known as Northern Land.



When they were all seated round the table, Truhanov addressed them.

Amundsen have worked further to the east, among the islands of the North American archipelago.

"But within this space there must be a continent as yet unknown, or an island, about half the size of Greenland. Perhaps there is a whole archipelago there. Look, the problematical land which Crocker saw in the distance from afar is indicated on the eastern edge of this space, on the southern edge is Kennan's Land. Nansen thinks there is no large land area in that part of the Arctic; but Peary is sure that from Cape Thomas Hubbard he saw the fringe of a great continent lying to the north-west.

"Harris, a member of the United States coastal and geodetic survey, is convinced of the existence of this continent, on the basis of his study of the tides on the northern shores of Alaska. According to him, the entire course of these fluctuations in the level of the Beaufort Sea shows that they come not from the Pacific through the small, narrow Bering Strait, but from the Atlantic, through the deep gap between Norway and Greenland; between the supposed continent and the shores of Alaska and Siberia, these fluctuations become weaker and weaker. If this continent did not exist, the tidal wave would pass from the Greenland Sea across the North Pole straight to the shores of Alaska and Chukotka, without being delayed or weakened. The existence of the continent is further shown by the fact that in the Beaufort Sea, which is open to the west, west winds strengthen the tidal wave while east winds weaken it, and the difference in the height of the wave is as much as six feet. This can only happen in a narrow sea between two continents. The supposed continent is separated from the islands of the North American archipelago only by a narrow strait. Were this strait a wide one, the tidal wave from the Atlantic Ocean could reach the shores of Banks Island and there meet the tidal wave passing round this continent from the west to the south, and the two waves would be bound to cancel each other out. But M'Clure's observations on the west coast of Banks Island have shown that there the tidal wave coming from the west, from the Beaufort Sea, is still predominant.

"And so," said Truhanov, concluding his address, "the existence of a continent or of a close-packed group of large islands in that part of the Arctic can be regarded as almost beyond doubt, and it only remains to discover this and to annex it to Russia. I hear the Canadian Government is fitting out an

expedition to penetrate the blank space from the east this summer. We cannot delay any longer: we must make our way into that region from the south and south-west, from the Bering Strait side, or the last unknown piece of the Arctic will be explored and the whole of it seized by the British.

"That is why I have decided to organise an expedition and send it there, and why I have invited you to take part in this expedition.

"Now let me tell you my plans. A vessel of the same type as the *Fram*, but with improvements based on the experience of the latest voyages, has been under construction since the autumn. In a few days it will be launched, and its captain will take charge of the final arrangements. By the end of April, according to the contract the vessel must be completely ready, and about May 1st it will be at Vladivostok to pick up the members of the expedition. Early in May we shall set out for Kamchatka, where, at Petropavlovsk, we shall take on board a team of sleigh-dogs and one or two Kamchadales with experience in managing these animals. If we can't do this in Kamchatka, we can get dogs on the Chukot Peninsula, in the Bering Strait, where we'll have to lay in a stock of dried fish for the dogs, and Arctic clothing for the human beings. After passing through the Bering Strait we shall not head north-west, as the *Jeannette* did, but north-east, straight towards the unknown land. Soon we shall encounter ice and shall make our way through it as far as we can; it is quite probable, however, that we shall not reach the shore of this land in our ship but shall send out a sleigh party which must penetrate north as far as possible. It will be furnished with supplies for a year in case it has to winter there. At the edge of the land the ship will set up store-dumps at agreed distances, so that the sleigh party can find supplies for a second year in case of need. But if by the end of next summer the ship has not returned to a port in telegraphic communication with Europe, then in the following spring a rescue expedition will be sent to look for the ship and to pick up the sleigh party.

"So you see," Truhanov concluded, "though the task of the expedition is not to reach the North Pole from a new direction but only to explore a supposed continent lying to the north of the Bering Strait, even so this is a fairly difficult task. If things turn out well we shall get home in the late autumn of this year, perhaps without even seeing the unknown land; but it is more

likely that we shall have to winter there and return a year or two later. At worst we may perish; each of us should bear that in mind and make his arrangements accordingly."

Truhanov paused a moment to give his listeners time to think over their attitude to the matter, then added:

"If any of you, now that you have heard the plan of the expedition, find it impossible to take part in it, I would ask you nevertheless not to mention our plan to anyone before the beginning of May, lest foreigners steal a march on us."

"If I am not mistaken," Kashtanov observed, "when you were speaking about the sleigh party, Nikolai Innokentyevich, you put it like this: 'we shall send it out.' Don't *you* intend to take part in exploring the unknown continent?"

"Alas, no, Pyotr Ivanovich. I shall go with you in the ship and stay in it, because I am hardly able to walk. One of my legs is artificial below the knee; I smashed it badly while travelling through the Sayan mountains and now I'm only fit for a sedentary life."

"Whom will you send as the sleigh party?"

"Everybody present, except the captain and myself, and one or two Kamchadales or Chukchis, five or six altogether. Investigation of all three realms of Nature will be ensured, and the meteorologist besides studying atmospheric phenomena will determine latitude and longitude. Eh, Ivan Andreyevich?"

"That's right, I have enough experience to do that," answered Borovoy.

"I don't ask for an immediate decision about joining the expedition," Truhanov went on. "Let each of you think over my suggestion quietly in private."

"When must we give you our answer?" asked Papochkin.

"A week from now at the same time. Unfortunately I can't give you any longer since if anyone declines I shall have to find a substitute, and at the end of January I return to Siberia to make arrangements for my observatory, which I shall be leaving for a long time."

A week later at the same time the same people met in Truhanov's room, except for the captain, who had already left to take over the ship. None of the scientists refused to take part in the expedition—it was too tempting, in spite of its possible privations and dangers. Truhanov was delighted and remarked

that this unanimity and lack of hesitation among the participants almost guaranteed in advance the success of the enterprise. The plan was studied a second time, and each member made notes according to his speciality about the scientific and personal equipment he would need.

The following day they went their several ways, to prepare for the expedition and wind up their private affairs.

III

ON A LONG JOURNEY

ON April 20th Professor Kashtanov, the zoologist Papochkin, the meteorologist Borovoy, and Dr. Gromeko, all set out by the Trans-Siberian express from Moscow where they had forgathered by mutual agreement from the various parts of Russia where they lived; and within ten days they arrived at Vladivostok.

At their hotel the travellers found Truhanov already waiting; he had arrived a week before to make various purchases and to receive stores he had ordered. The next day, May 1st, the five men went down to meet the ship *Pole Star* when it dropped anchor in the port. The captain's weather-beaten face beamed at them from the bridge.

Three days were taken up with loading of coal, oil, victuals, scientific equipment and personal baggage. The members of the expedition went on board on the third day. All was ready by the morning of May 4th, customs formalities were concluded, crew and passengers in their places.

Smoothly cleaving the waves of the Bay of the Golden Horn, the *Pole Star* rounded the Ass's Ears at noon and headed eastward past Russian Island. All five members of the expedition gazed their farewell to the city as it floated away from them, spread out like an amphitheatre on the hills beyond the green waters of the bay; in his heart each could not help wondering if he would ever again see this shore, or any part of his homeland.

And each grew a little sad at the thought. But the fresh sea wind and the slight pitching which began after the ship left the bay quickly put an end to their thoughts about the shore they had left. The gong sounded and the explorers, with a last glance to the dark strip of land fading into the distance behind them, quickly went below to breakfast.

After the meal all went on deck again, to gaze at the dark mass of Askold Island, the last piece of their own country they would see until they reached Kamchatka. After passing this island, the *Pole Star* turned eastward; the wind had fallen, and the vessel was gliding smoothly over the blue waters of the Sea of Japan, which stretched southward and eastward to the horizon. Only towards the north, ten or a dozen miles away, stretched the dark line of the Ussuri shore. At sunset they passed beyond Cape Turning-point and the shore disappeared from view.

Changing direction, the ship veered north-east.

"What port are we heading for?"

"None, unless a bad storm makes us. But the barometer is keeping up, and no storm is expected before we reach the Kuriles."

"And there?"

"There the cold Sea of Ohotsk will probably cause some unpleasantness. This rotten corner of the Pacific Ocean nearly always gives trouble to ships heading for Kamchatka. Sudden storms, fogs, rain or snow are frequent there, especially in the spring and autumn. Still, it will prepare us for Arctic conditions."

Thanks to the calm sea everybody slept well that night and had a good rest after the toil of the preparations for their journey. But the following day Truhanov's forecast was confirmed. The barometer fell sharply, a piercing nor'wester blew, the sky became covered with grey storm clouds, and a thin rain began to fall. In the latitude of Cape Endurance the *Pole Star* turned nearly due east and entered the open Ohotsk Sea, moving further and further away from Sahalin. A strong roll began, and the voyagers spent a rough night.

Next day the weather improved. Rain alternated with snow. Dark waves with white crests of foam were bearing down upon the port side and the whole deck was flooded with spray. They had to sit in the wardroom, whiling away the time in chat. Papochkin and Borovoy, who were worst affected by the ship's

rolling, had not appeared at breakfast or lunch. The captain left his post in the deck-house only for brief intervals. The storm was not heavy and moderated during the night. In the morning the dark bulk of Paramushiro Island, biggest of the northern Kuriles, loomed before them, and to the right of it they saw the smaller islands Makanrushi and Onnekotan, with the volcano Toorusyr, from which a dense column of smoke was rising. The wind had ceased altogether and the smoke went straight up and spread out in the upper layers of the atmosphere into a great cloud which was barely visible against the dull sky. A few miles to the south the Avossa rock rose sheer out of the water, a giant pillar looking like a huge black finger threatening the ship. White surf marked off its base sharply from the surface of the sea, which in the grey light seemed olive-green.

"How gloomy these islands are!" Papochkin exclaimed, when he came out on the deck at the news that land was in sight. "Dreary black and reddish rocks with shrubs creeping over them."

"And continual fog; rain in summer, blizzards in winter," Truhanov added. "Yet people live here."

"The Kurile Islands are entirely of volcanic origin," Kashatanov explained. "There are twenty-three volcanoes on the islands, of which sixteen are more or less constantly active. This chain, joining Kamchatka to Japan, extends along the western edge of the great abyss in the sea-bottom called the Tuscarora Deep, which goes down nearly six miles. The lines of major faults in the Earth's crust are usually marked by volcanoes, and frequent earthquakes show that movement is still going on within and disturbing the equilibrium."

IV

THE LAND OF SMOKING HILLS

IN the afternoon a following wind enabled the *Pole Star* to proceed under full sail, and she headed towards Kamchatka, which was already visible on the horizon. Soon the ship was

abreast of Cape Lopatka, and then a line of volcanic hills lay in sight. Some were conical, others truncated, and they were joined together by a series of low ridges. The snow covering the graceful conical summits and the crests of the linking ridges glistened brightly against the dark sky. The moonlit night allowed the ship to pass without risk into the narrow gateway of Avacha Bay. With sails furled, the *Pole Star* glided quietly between the high cliffs and arrived in a wide bay where there was not a single light on the shore to suggest the presence of human beings. It was already past midnight and the little town of Petropavlovsk had long since been asleep. The calm waters of the bay gleamed like silver in the bright moonlight; far off to the north, Avacha Hill rose like a white spectre against the dark sky. The air was frosty; Kamchatka seemed still in the grip of its winter sleep.

An hour later the ship cast anchor a hundred yards from the slumbering town. The rattling of the anchor chain woke the dogs, and the silence was broken by barking and howling, to which, however, none of the townspeople apparently paid any attention. This concert was repeated more than once and was evidently nothing unusual.

Next morning the voyagers were roused from sleep by the sound of movements on deck. Coal, fresh water and provisions were being taken on board. They hurried on deck. The sun, already high above the mountains, was shining brightly, and the town had come to life. After their long voyage, they wanted to feel firm ground under their feet, so they breakfasted quickly and went ashore in the ship's boat which was fetching provisions. The whole population of Petropavlovsk was already assembled to gaze at the ship and its passengers, to hear the latest news from their distant homeland, and to discover whether goods that they needed had been brought.

Behind this crowd the wretched cottages where they lived straggled in artistic disorder over a gentle slope; amongst them a few buildings stood out by their size and solidity—the town school, the hospital, the new headquarters of the provincial administration, and a few warehouses.

The voyagers were surprised by the absence of any sort of street. The cottages were scattered about just as their builders or owners had pleased, some facing the bay and others away from it.

Around each house there were barns, storehouses, cattle sheds and racks for dried fish. Heaps of dirty melting snow still lay in places, with rivulets of muddy water running down from them to the sea, and pedestrians had to jump over these, as there were neither pavements nor bridges.

The travellers were struck by the almost complete absence of poultry and small animals. The reason for this was that the sleigh-dogs, without which nobody could live in Kamchatka, killed off all small creatures, especially towards the end of winter, when stocks of dried fish were exhausted and the dogs were famished. These dogs, handsome shaggy beasts of various colours, were to be seen around all the houses. Some were posed about the place sunning themselves, others were scrabbling in the domestic rubbish dumps, or quarrelling or playing together. The travellers looked with interest at these animals, some of whose relations were to take part in the *Pole Star* expedition as means of transport across the snow and ice of the unknown land. With winter travel at an end and all Kamchatka covered in slush, the dogs were now enjoying a well-deserved rest and enduring an undeserved Lent, which was apparent in their sunken flanks and hungry looks.

Despite the zigzags which they continually had to make between the houses and outbuildings, the travellers perambulated the whole town in less than half an hour and arrived on its outskirts, where the botanist hoped to gather spring flowers. But his hopes were dashed, for everywhere thick snow was still lying, and only on the steepest part of the hillside, where it had thawed, did he find some young anemones. Spring comes late to Kamchatka, owing to the abundance of winter snow and the influence of the cold Ohotsk Sea; the land is free of snow only at the end of May. But on the other hand, the autumn lingers to the middle or end of November.

From the lofty edge of the town there was a wonderful view over the whole of Avacha Bay, surrounded by a ring of mountains, with cliffs falling sheer to the glassy surface of the water, in places; and elsewhere the land sloped gently, broken by the valleys of streams already unfrozen.

The ring of mountains stood back from the shore only on the western side, where the low-lying delta of the River Avacha could be seen. At the mouth of this river they could make out the cottages composing the settlement of the same name which

was the only inhabited locality besides Petropavlovsk on the shore of this magnificent basin over twelve miles across, capable of accommodating the fleets of all the powers, great and small, splendidly protected on the seaward side and yet none the less astonishing the beholder by its emptiness. Not a single sail gleamed on its mirror-like surface; the surrounding hills, covered with forest, still showed white in their winter covering.

When they reached the shore, our travellers saw a curious spectacle. By the water's edge stood the thirty dogs which were to go with the expedition, harnessed in couples. They were surrounded by some sailors and a crowd of sightseers, and were howling, scuffling and making attempts to run away. Near the shore was floating a large clumsy boat in which the dogs were to be embarked. A thick-set man, naked to the waist, who was evidently a dog-team driver, seized a couple of the struggling and howling animals by the scruff of the neck, carried them to the boat and put them down in the stern. But as soon as he had turned his back to go for the second pair, the intelligent dogs, who obviously had no special desire to go for a sea trip, jumped ashore and mixed with the others. This happened several times, to the general merriment of the onlookers. Neither kicks nor shouts were of any avail; the dogs did not want to leave their homeland. The dog-team driver lost his temper and swore at the dogs in Russian and Kamchadale, the spectators guffawed and offered him various pieces of advice, the dogs howled—the uproar was unimaginable.

Eventually the driver hit upon a method of embarking his shaggy passengers which, though clever, was not very pleasant for them. He pushed the boat about five yards out from the shore, handed its mooring-rope to one of the sailors, and then began throwing the dogs in pairs across the water into the boat, ignoring the resistance they tried to put up. Wriggling as they flew through the air, the dogs tumbled to the bottom of the boat, then leapt up and placed their front paws on the edge; they were in despair, but could not bring themselves to jump into the water. When all the writhing couples had been embarked and were still howling and bounding about in the boat, the sailors drew its bow towards the shore; they and the driver quickly jumped aboard and began to row. At the first stroke of the oars the lively pack of dogs fell silent as though at the wave of a magician's wand, and remained so throughout the entire crossing. But as

soon as the boat bumped against the side of the *Pole Star*, the concert broke out again with redoubled force. From the shore people could see the dogs being hoisted up on to the deck in pairs in a bucket lowered over the ship's side at the end of a rope, and the driver putting them inside a pen which he had brought with him, where a generous portion of dried fish helped to reconcile them to their lot.

The sound of bustling about on deck, the rattling of the anchor-chain and the howling of the frightened dogs roused the travellers early on the following day and they quickly went on deck to take a last look at the town and its inhabitants who had gathered on the shore to see them off. To shouts of "Hurrah!" and "Happy voyage!", accompanied by waving of hats and handkerchiefs, and to the howling of the dogs, the *Pole Star* turned smoothly and headed across the bay towards the outlet to the open sea. The shore fell away behind them, and the snow-white cone of Avacha Hill stood forth from among the hills close to the town; a slender, transparent column of smoke arose from its summit.

"Our hill has begun to smoke!" said a voice behind the travellers as they stood at the side of the ship admiring the beautiful scene.

Everyone turned round. It was the vigorous man who, the day before, had thrown the dogs into the boat. He was now dressed in a *kuhlyanka*—a short coat made of reindeer skin with the hair outside. The narrow and slightly slanting set of his brown eyes, his prominent cheekbones, the swarthinness of his face, his flat nose and scanty black whiskers at once betrayed his Mongolian origin. Smiling, he gazed at the travellers.

"This is a new member of our expedition, Ilya Stepanovich Igolkin, who is in charge of the dogs and will drive the leading sledge. He will teach us how to handle these temperamental creatures," said Truhanov, greeting the driver.

"Our dogs are very placid, sir," the latter replied. "They have quieted already. Nobody likes to leave his homeland, that's the reason they howled."

When Igolkin had gone to see to his dogs, Truhanov told his companions something about this member of the expedition. Igolkin was a native of Transbaikalia, a Buryat Cossack from a *stanitsa* on the frontier of Mongolia. He had served in the war with Japan, after which he had stayed in Vladivostok. He had

gone to Kamchatka with a scientific expedition, and had taken a fancy to that land of smoking hills, with its great spaces, abundance of fish and opportunities for bear-hunting. He had found a second homeland there, quickly adapted himself to the peculiar conditions of life and had become well known to everyone in Petropavlovsk as a skilful dog-driver and guide to hunters. He had been induced to join Truhanov's expedition by the incentive of a high salary, paid a year in advance, which had enabled him to build a house and to buy cattle and hunting guns.

Within an hour of raising anchor, the *Pole Star* had entered the three miles wide gateway of Avacha Bay. To the right of the entrance, against the precipitous cliffs of Cape Babushkin, the huge black bulk of the Babushkin Rock rose out of the water, three hundred feet tall, with its flat top forming a convenient site for sea-birds to build their nests on.

Hundreds of gulls, cormorants and other birds, frightened by the noise of the engine, were fluttering round this rock, filling the air with their shrill cries.

After rounding Cape Distant, with its lighthouse, the *Pole Star* turned north-eastward along the eastern shore of Kamchatka, and gradually drew farther away from it. For two days there was nothing to see. Moreover, a cold north-east wind blew and brought rain, snow or hail. The sea was choppy and the warm cabins were more tempting than the damp deck. At last the wind dropped; but then came floating ice and fog. The ship decreased speed for a couple of days to avoid collision with the icefield. When the weather cleared they could see on their right the shore of the rocky island of St. Lawrence and on their left Chukot Cape. To the west of the latter, on the shore of the deep Bay of Providence, was a depot where coal for the expedition had been dumped by a ship they had chartered. The *Pole Star* dropped anchor and began to coal. After their week at sea they all hastened to set foot on shore again. But the rocky shore offered no scope for a walk, and the slopes behind were covered with snow; only a small area round the depot was free from it.

V

THE BERING STRAIT

TWO days later the *Pole Star* rounded Chukot Cape and entered the Bering Strait, hugging the Asian side, where low hills fell sharply to the sea's edge or sloped gently into broad valleys that stretched far into that gloomy land. Though it was the end of May, great expanses of snow still lay everywhere; only the steep southern and south-western slopes of the hills were free from it, and were even green with young grass or the tender shoots of creeping bushes of Arctic willow and birch.

Wreaths of mist swirled frequently across the green waves of the strait, hiding the horizon. The sky was covered with small leaden-grey clouds from which now rain, now snow fell upon the ship's deck. From behind these clouds the sun sometimes peeped, giving light but little warmth. In its beams the inhospitable shores of the far north-east of Asia began to look rather more cheerful.

When the mist was dispersed by gusts of wind which chased white horses over the green waves, it was possible, looking east, to see the low, faintly bluish coastline of America. Floating ice came their way with increasing frequency; not in compact masses, but in small sheets, or in splendid hummocks, whose whimsical shapes delighted those who were in northern waters for the first time. The approach of a more substantial icefloe was usually heralded by fog, so that ships' captains could change course to avoid collision with the ice.

The shore seemed uninhabited: they saw no smoke, nor sign of man or beast. Great was the amazement of our travellers, therefore, when they saw emerging from a small bay which appeared behind a rocky cape, a boat with one man in it, who was paddling hard athwart the course of the *Pole Star*. When the man in the boat realised that the ship was going to pass him, he began to shout and wave a handkerchief.

The captain signalled dead slow and shouted through his megaphone to the boat to come alongside. As it drew near they saw that it was a Chukchi canoe. The captain, presuming that some Chukchi had stopped the ship to ask for alcohol or tobacco,

was on the point of ordering: "Full speed ahead." But at that moment the man in the boat, who had come quite close, bawled:

"For God's sake take me on board."

The engine was stopped and the canoe drew alongside. A ladder was lowered. The stranger quickly climbed on deck, took off his fur hat with earflaps and said joyfully:

"Thanks; now I'm saved!"

He was a tall, broad-shouldered man, with a sun-tanned face, blue eyes and a fair, dishevelled beard. The wind played with his gingery hair, which seemed not to have been cut for a very long time. He wore Chukchi costume, and in his left hand he carried a small but obviously very heavy leather bag.

Truhanov went up to the man, held out his hand and said:

"You've been shipwrecked, I suppose."

At the sound of Russian speech, the stranger's face beamed. He looked quickly at the members of the expedition, placed his bag on the deck, and began shaking them by the hand, each in turn, the words tumbling out as he said, in Russian:

"I'm overjoyed that we are fellow countrymen. I'm Russian, you see. Yakov Maksheyev, from Yekaterinburg. What luck to have met a ship, and that it should be a Russian one, too! I found a goldfield on the Chukot coast. My stocks of food gave out and I was forced to leave it. This is the second day I've been paddling southward in the hope of coming on some inhabited place. Please give me something to eat: all I've had for two days is mussels."

Truhanov, accompanied by the rest of the travellers, led the new passenger to the wardroom, where they gave him a cold snack and some tea, to fortify him until dinner, which was not yet ready. Talking with his mouth full, Maksheyev told the story of his adventures:

"I'm a mining engineer and these last few years I've been working in the goldfields of Siberia and the Far East. By nature I'm a rolling stone, I like to travel around and get to know new places, and when last year I heard from the local people that there was rumoured to be gold in Chukotka, I made up my mind to go there and look for it. But, to tell the truth, what drew me here was not so much the gold as the desire to have a look at this out-of-the-way region.

"I set out along with two of the local people who volunteered to go with me and we arrived safely on the Chukot coast. There

I succeeded in finding a rich deposit of gold and panned a lot of dust. As our stock of provisions was limited and I intended to stay there a little longer, I sent my companions to the nearest Chukchi settlement to get food, but they still haven't returned, though it's more than a month since they left."

When Maksheyev had finished his story, Truhanov explained to him that the *Pole Star* was not a trading vessel and that, as she was going as fast as possible to the north, they could not put him off at any port.

"All we can do is to transfer you to any ship we happen to meet that's heading the other way," he concluded.

"But if your ship's not a merchant ship, what's its business in these waters, and where's it making for?"

"It's carrying a Russian Arctic expedition, whose members you see before you; we are making for the Beaufort Sea."

"Well, then, it seems I'll have to go with you for the time being, unless you intend to maroon me, like Robinson Crusoe, on some desert island!" Maksheyev said with a laugh. "But I've told you that I have nothing but what I stand up in: no spare linen or decent clothes, nothing but the filthy lucre which gives me the means of paying you."

"There's no question of that," Truhanov broke in. "We're helping a fellow-countryman out of a hole and we're very glad to do it. We've got enough linen and clothes and you're about the same size and build as I am." They showed Maksheyev an empty cabin where he could wash, change his clothes and put away his gold. That evening he turned up in the wardroom looking a different man and regaled the voyagers with stories of his adventures. The new passenger made a very good impression on them all, and when he had gone to bed, Truhanov turned to the others and asked:

"Shall we invite him to join us? He's obviously a vigorous fellow, tough and experienced, pleasant and sociable, a good man to have around in any circumstances."

"Yes, and thoroughly civilised too, in spite of the hard life he's led in wild places," Kashtanov remarked.

"He knows Eskimo, which might be useful when we get to the land we hope to find, since if there are people there they'll be Eskimos," added Gromeko.

"All right then, if you all agree, I'll suggest to him that he join our expedition," said Truhanov, ending the discussion. "Or,

rather, I'll wait a few days; he can't go off anywhere, and we'll get to know him better."

Next morning, at Maksheyev's request, the *Pole Star* turned from its course and entered the great Bay of St. Lawrence, on the northern shore of which his goldfield lay. He wanted to collect his modest belongings and also suggested to Truhanov that they dismantle his little hut and take it with them; it might be useful to the expedition if they had to winter in the land they were seeking. This hut and the shed attached to it consisted of sections carefully joined together, so that in a few hours it could be taken apart and loaded into the ship. The *Pole Star* cast anchor near the shore and both crew and passengers set to work. By the afternoon the hut was loaded on to the deck and the vessel continued its way northward.

VI

IN SEARCH OF AN UNKNOWN LAND

LATE in the evening, when the midnight sun was a red ball on the far horizon, the *Pole Star* passed from the Bering Strait into the Arctic Ocean. Far to the west they could see the north-eastern corner of Asia, Cape Dezhnev, the expanses of snow that covered its steep slopes crimsoned by the rays of the sun. The travellers bade a silent farewell to the shore which though inhospitable and uninhabited, nevertheless was part of their homeland. To the east they could discern, through the thin mist, Cape Prince of Wales, which was already behind them. Ahead, the sea was almost clear of ice. The wind had been coming mainly from the south during the last few days, and this, together with the warm current flowing along the American side of the Strait, had driven most of the ice northwards, creating very favourable conditions for further voyaging.

When our travellers came on deck next morning land was no longer visible to the west. To the east, however, land was still to be seen—the coast of Alaska, with rocky Point Hope and

Cape Lisburne, behind which, to the south-east, lay Kotzebue Sound.

The wind was a following one, and, with all sails set, the *Pole Star* skimmed the waves like a huge seagull. From time to time icefloes were passed and small icebergs which rocked gently as they swam slowly, driven by the wind, towards the north-west.

When the Alaskan shore began to sink below the horizon, Maksheyev, standing at the ship's side with the other passengers, exclaimed:

"Farewell, former Russian land, jewel given to the Americans."

"What do you mean?" said Borovoy, surprised. "So far as I remember, our government sold this dreary country to the United States."

"Yes, they sold it for seven million dollars. And do you know how much the Yankees have already made out of this same dreary country?"

"Well, I suppose about twice that amount."

"You're very wide of the mark. They've had two hundred million dollars out of Alaska in gold alone. And besides the gold, which is still far from being exhausted, there's silver, copper, tin and coal which they're beginning to mine. Then there are the furs, and the great forests along the Yukon. They're building a railway, and there are steamers on the Yukon now."

"Well, we've no cause for regret," Truhanov observed. "If Alaska had remained in our hands it would still be in the same primitive state as Chukotka, where there is gold, and coal and furs too, but they're of no benefit to anybody."

"For the time being," Kashtanov replied, "Russia's free development is crushed by the autocracy. But, with a change of government, perhaps we'll start to work on the grand scale; and then Alaska would be very useful to us. If we possessed it as well as Chukotka we should command the entire north of the Pacific Ocean and not a single American pirate would dare to poke his nose in there, whereas now they feel themselves masters in the Bering Strait and the Arctic Ocean."

"And even in Chukotka!" added Maksheyev bitterly. "They trade with the Chukchi, bartering alcohol for furs and walrus tusks and skins."

The following morning no land was to be seen anywhere. The *Pole Star* was travelling at reduced speed over a sea which seemed

boundless, in spite of the ice which gleamed white on all sides. There was dense fog on the horizon ahead. The wind fell, and from time to time there was snow; visibility quickly decreased and the vessel slackened speed. The temperature of the air was less than a degree above freezing point. About midday the sun shone through and it was possible to determine the latitude, which was $70^{\circ}3'$ North. Thus the *Pole Star*, thanks to a following wind and an almost clear sea had managed in thirty-six hours to cover a third of the distance between the Bering Strait and the land which was its goal.

These favourable conditions held during the two next days, and the voyagers arrived at latitude $73^{\circ} 39' N$. On the evening of their fourth day in the Beaufort Sea, however, the ice grew denser, and the ship was obliged to work slowly through the narrow gaps between the floes.

During all this time they had not met one other vessel; evidently it was still too early for the whalers. This being so, Truhanov said to Maksheyev:

"You see how it is, Yakov Grigoryevich, we haven't met any whalers, so you'll have to stay on the *Pole Star* as my guest, whether you like it or not—unless you prefer to go with the sledge party, if and when we find the land we're seeking?"

"Though I should enjoy your company," was Maksheyev's reply, "I should find it hard to spend six months or a year idle on an icebound ship. It would give me great pleasure to join the sledge party, and I think I might be useful. I have some experience of travelling on skis and of travelling with dogs, and I could share the job of looking after them with Igolkin. I can cook too, and I could carry out surveys and help Professor Kashtanov with his geological observations. As a mining engineer I know something about geology."

"In that case, I regard the question as settled, and I'm very glad that our expedition has gained such an energetic and experienced member," said Truhanov.

The arrangements for Maksheyev to join the expedition were quickly settled and that evening he showed Kashtanov the collection of minerals from Alaska and Chukotka which he had made in the course of his prospecting. The professor examined the collection and convinced himself that Maksheyev had enough sound training to ensure his being very useful later on.

When night fell they had to spend several hours without moving. With the dead calm the fog grew so dense that visibility was less than ten yards; everything seemed drowned in watery milk. The *Pole Star* was still surrounded by a great sheet of ice, and all except those on watch were sound asleep.

Next morning the fog began to clear a little under a breeze from the north. The travellers got ready to resume their voyage. The wind soon became fresher, the fog gradually dispersed, carried away to the south, and the icefloes rustled as they too began to stir.

A fairly free passage opened before them, and the *Pole Star* set forth again, under steam, in a north-north-easterly direction, slowly, to avoid collision with the ice and to be able to stop or to change course easily. They continued to advance all through the evening until midnight; but then the sun, which had been shining since midday, though with some breaks, was obscured by cloud on the northern horizon. This night was less peaceful than the previous one: a light north wind blew and the icefloes were in movement, pressing one against the other, cracking and breaking. The fog as it piled up concealed the way ahead, and forced the ship to remain stationary for longer periods and its passengers to be even more watchful than before, to avoid getting crushed between the great icefloes.

Next morning the north wind was stronger; the fog had been blown away, but the ice was moving more violently; the day passed under great strain. The captain needed all his experience to make his way slowly forward, manoeuvring between the masses of ice, reversing, swinging to port or starboard. Sailors with long boat-hooks stood on both sides of the ship, ready to push back the ice bearing down on it. Fortunately the edges of the icefields were already much broken up, there were no icebergs, and only occasionally did ridges of crushed ice, piled up here and there on the icefields, present a more serious threat.

That night all the passengers had to join in the fight against the ice so as to give the sailors a chance of resting. There was no fog, a fresh north wind was blowing, and the ship made progress. In the morning they noticed a flock of birds flying northward, and two bears walking across a big icefield half a mile away from the vessel. These were signs that land was near.

When the latitude was taken about midday it was found to be

75°12'5"N. This meant that, despite the ice, the *Pole Star* had managed to advance 1°33'5" northward in three days and nights. When the captain traced the ship's course on his chart, Truhanov remarked to the members of the expedition assembled round the table:

"So far we've done extraordinarily well. In 1879 the *Jeannette* which, like the *Pole Star*, came through the Bering Strait, spent the entire summer threshing about in the ice without even reaching 73° north latitude; at the beginning of September she was finally icebound a little to the north-west of Wrangel Island. Yet we have succeeded without much difficulty in getting as far as the 75th parallel, in four and a half days and nights."

"Now we could reach land on foot, if the ice finally stopped us from sailing any further," said the captain. "I reckon that it can't be more than fifty or sixty miles away."

VII

FRIDTJOF NANSEN LAND

LATE in the evening of that day the northern horizon, contrary to what usually happened, became clear of fog and clouds, and when the sun had sunk almost to the horizon they made out against the crimson background of the sky a distant chain of jagged hills.

"That must be land!" the captain exclaimed, when he had examined it through his telescope. "Icefields never have that sort of outline, and, besides, there are a lot of dark spots on the white ground."

"And it's nearer than we thought! I believe it's not more than thirty or forty miles away," Maksheyev remarked.

"So the Arctic continent does exist, and our expedition has not been in vain," said Truhanov, with satisfaction.

They were all excited by the sight of land and did not go to bed for a long time. The absence of fog enabled them to see an unusual spectacle—the midnight sun rolling its fiery ball above

the crest of a distant mountain range and again beginning to rise higher in the sky.

The *Pole Star* advanced all through the night and the following morning, its course taking it as before between icefloes of greater or less density. At midday determination of latitude showed that in twenty-four hours the vessel had travelled nearly half a degree northward.

Towards evening the sun, which had been shining almost without a break since the morning, something very unusual in those latitudes, was obscured by cloud. Soon the whole sky clouded over and a snowstorm broke as in the depth of winter. The fine snow blinded them and everything was hidden in a whitish haze. The wind could not raise much disturbance in that sea, densely covered as it was with ice, but the icefloes were set in motion, clashing together, and at their edges, where the floes piled up one on top of another, hummocks arose, sometimes over twelve feet high. The ship was in danger. They were forced, while keeping steam up, to remain almost stationary, thrusting off ice. All hands were on deck, and only thanks to the design of its hull did the ship withstand the pressure of the ice. At last the *Pole Star* managed to get into open water on the east side of a huge icefield, protected from direct pressure, and there the ship spent the rest of the night in peace.

About noon the next day the snowstorm abated, the sun shone through, and it was possible to determine the latitude. To everyone's unpleasant surprise it turned out that the north wind had driven the vessel southward along with the ice. But this wind had at the same time broken up and disintegrated the icefield so that during the following two days, when the weather was dull and subdued, the *Pole Star* made headway fairly easily and undoubtedly progressed a considerable distance northward.

Land seemed near, judging by the fact that soundings, which had shown a depth of five to seven hundred fathoms in the Beaufort Sea, now touched bottom at eighty fathoms. Evidently the under-sea shelf of the Arctic continent began here. But owing to the dull weather, low-hanging cloud and drizzling rain, this near-by land was quite invisible. On the evening of that day, June 2nd, soundings showed only twenty fathoms and compact ice lay ahead. The ship moved slowly to avoid grounding on any shoal such as might be expected near the land. That night

they had to heave to for a few hours, as the dense fog hid everything around them.

In the morning an east wind arose, the fog dispersed, and the *Pole Star* was revealed to be lying near the edge of a wall of ice about sixty feet high that stretched east and west along the very horizon.

"It's probably a barrier of continental ice encircling the Arctic land, like the barrier around the South Pole," said Truhanov to the members of the expedition as they crowded on deck.

As the place was not suitable for disembarking the sleigh party, the ship headed eastward in the hope of finding a bay or a break in the barrier which would enable them to climb up on to the surface of the ice. Soundings showed sixteen fathoms, leading them to suppose that the wall of ice was based on the sea bottom.

To move very close along the wall was not without danger, as quite frequently large blocks of ice fell into the water from the sheer, occasionally overhanging mass of the wall, which was broken by numerous fissures. Some of these fissures had become deep but narrow canyons through which streams rushed in cascades.

The party moved slowly along. As they had to avoid shoals and icefields, they advanced only about twenty-four miles in twenty-four hours. But that evening a long salient appeared ahead of them, as though the wall turned off to the south, changing direction. When the *Pole Star* drew nearer it could be seen that this salient was not composed of ice but was a rocky promontory of the land itself.

After supper they discussed the question of what to call the newly discovered land, and it was decided to name it Fridtjof Nansen Land, in honour of the great Polar explorer. The cape was named after Truhanov, in spite of his protests, by virtue of his being the organiser of the expedition.

Just in front of the cape itself the wall of ice drew back a little to the North, forming a bay which, though small, was sufficiently deep to allow the sleigh party to land.

Work aboard ship was in full swing all through the night. They had to hurry so as to take advantage of the favourable weather. A south wind might come up, moving the icefields towards the shore and pressing them into the bay. Everybody lent a hand in unloading. Where the cape began, the wall of

ice became lower and divided into two parts, between which it was not hard to climb on to the surface of the ice. While the members of the expedition were sorting the things they had unloaded on to the shore and arranging them in the sledges, the sailors climbed on to the crest of Cape Truhanov; there they piled up a high cairn of stones around a pole, on which, to a threefold salute of the *Pole Star's* guns, they hoisted the Russian flag.

The cairn was intended also as a landmark for the ship, which was to cruise along the coast, surveying and studying it, and for the sleigh party, which was to explore the depths of the country and eventually to return to this cape, and join up with the ship again. Amid the stones of the cairn they placed a soldered zinc box containing a declaration that the land had been discovered on June 4th (17th) 1914 by the Truhanov Expedition in the *Pole Star*, and named Fridtjof Nansen Land. This declaration was signed by all the members of the expedition and stamped with the ship's seal.

Next evening all the members of the expedition gathered for the last time in the wardroom of the *Pole Star* for a farewell supper, over which they finally settled the problems of the subsequent movements of the ship and the measures to be taken should the sleigh party not return within a certain period.

The *Pole Star* was to set up a store-dump beside the cairn, containing enough food, fuel and clothing for several months, so that the sleigh party could survive the winter, if, for any reason it failed to meet the ship at that spot.

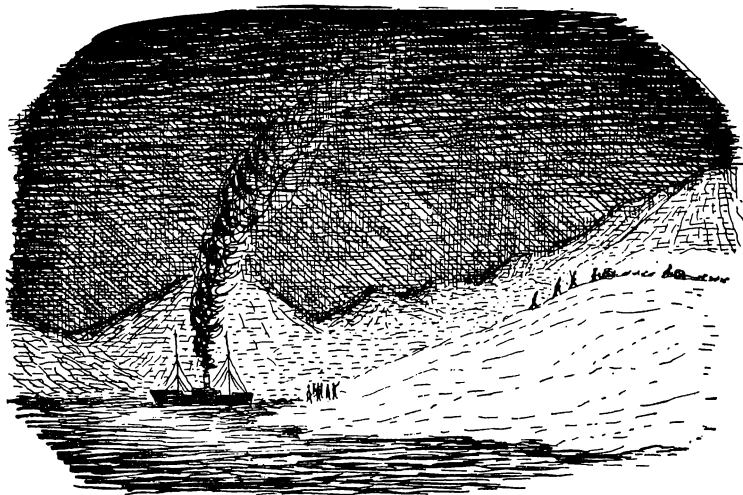
The sleigh party was to travel due north for six to eight weeks, then turn back southward, using another route if possible, but endeavouring to end up at Cape Truhanov. To lighten their load and ensure their safe return they were to leave dumps of food sufficient for three days at intervals of thirty miles or so, with notes of the direction they had taken, in case of need.

Next morning the *Pole Star*, dressed all over, fired a salute of both her guns in farewell to the sleigh party as they set forth. As Truhanov bade goodbye to Kashtanov he handed him a sealed packet, saying,

"If you should find yourself in serious difficulties in the course of your journey across Fridtjof Nansen Land, or if you cannot understand what you see around you, and don't know what to do next, open this packet. Its contents may help you to make the

right decision. But don't open it except in an extremity. If everything goes well there will be no need of my instructions and they may even seem quite unfounded."

After friendly handshakes all round at the top of the ice-barrier, to which nearly all the crew accompanied the members of the expedition, the three heavily-laden sledges, each drawn by eight dogs, and the six men, moved off towards the north. The six spare dogs ran alongside.



The three heavily-laden sledges, each drawn by eight dogs, and the six men, moved off towards the north.

VIII

ACROSS RUSSIAN RIDGE

THEIR route into the depths of Nansen Land ran for two days across a snow-covered plain which tilted gently northward and was easy enough to cross; there were few crevasses and most of these were packed with snow. The weather continued dull, and the following wind from the south brought thick clouds

which dropped snow from time to time and hid the horizon. The men and their dogs gradually grew accustomed to their work. Borovoy marched in front, trying the snow with his stick, so as to discover possible crevasses and with an eye on his compass so as to keep in the right direction. Maksheyev, Papochkin and Igolkin each walked beside a sledge, driving the dogs. Gromeko ran along a little to one side, but near enough to help any sledge that got stuck, and Kashtanov brought up the rear, like Borovoy with compass in hand, making a survey of the route. An odometer—a light wheel attached to a counter which recorded the distance covered—had been fixed to the tail of the end sledge, which therefore had to be carefully protected from damage.

All the explorers were dressed in the same Arctic costume. Each wore a Chukchi *kuhlyanka*, a fur-lined tunic with a hood. In case it got colder there were some more *kuhlyankas* on the sledges which could be put on over the first, but with the fur outside; as it was summer now, one was sufficient, and if it rained, this had to be changed for a knitted woollen jacket, since clothes made of reindeer fur are spoilt by damp. The men's legs were encased in baggy fur trousers, also with the fur inside, and soft fur boots. If the weather became exceptionally hot they could change all their fur clothing for woollens which they kept in reserve.

They were all on skis, with sticks in their hands. The plain was covered with a succession of *zastrugi*—troughs and ridges formed by the winter blizzards and only here and there somewhat levelled off by the thaw. These were a more serious hindrance to progress than the crevasses, which occurred very infrequently. Maksheyev amused everybody by his conversations with his sleigh-dogs, to whom he gave appropriate names; the leading dog, a big black creature, was called "General". For the night they set up a tent with a light but firm frame of bamboo; in this they laid out their sleeping bags in a circle round the wall, placing a spirit stove in the middle on which to cook their food and hanging a lantern from the cross-bar overhead. They tied the dogs to the sledges, arranged around the tent. At the end of the second day's march, when they had covered about thirty-five miles from their starting point, they set up their first store-dump for the return journey, marking it with a cairn of lumps of snow, with a red flag on top.

On the third day the plain's upward slope became more

marked and large crevasses appeared, slowing down their progress: they had to go more cautiously, sounding the snow in case of hidden crevasses. In the evening they came upon signs of a change in the type of country.

The wind was dispersing the clouds to the north and between the wisps and piles of cloud a chain of fairly high mountains occasionally appeared on the horizon. Black spurs of rock stood out against the snowy background of these mountains.

The midnight sun hung above the crest of the ridge, wanly gleaming through a sheet of cloud and colouring this with its reddish light. The snowy plain in the foreground was tinted blue, violet and pink by the light reflected from the sky. It was a striking scene, which they were the first humans to see.

The climb up to the ridge, to which they gave the name "Russian Ridge", took them three days, owing to great crevasses in the ice; their route took them across one of the transverse depressions lying between the rocky spurs.

The glacier which flowed along this depression down the southern slope of the ridge was over half a mile wide in places and was bordered on both sides by fairly steep, dark faces of rock alternating with gentler slopes thickly covered with snow. The former were strewn with fragments of basalt¹ both large and small, and here and there, in sheltered spots, little patches of greenery had appeared, with Arctic vegetation growing. Kashanov examined the cliffs as they went along, and Gromeko collected plants. There was practically nothing for Papochkin, however; during a whole day he picked up only a few insects, half-dead in the snow, or alive in the green patches.

The low dense clouds which hid the sky seemed almost to brush the heads of the explorers, who were advancing through something like a wide but very low tunnel with a white, rugged floor, black walls and a grey ceiling. Wherever the gradient of the valley bottom grew steeper the surface of the ice was transformed into an ice-chute, broken by numerous crevasses and often forming a chaos of lumps of ice over which they had to drag the sledges; both men and dogs became exhausted and only covered about seven miles in the day under these conditions. The weather continued dull. The south wind brought low clouds

¹ Basalt—a black or dark-grey, heavy, volcanic rock, either close-grained or vesicular. It is erupted by many volcanoes now active, as liquid lava which forms streams or lakes.

which hid the crests of the rocks; the dark slopes of these formed the edge of the glacier along which the sledges proceeded with great difficulty. In the worst places the explorers had to unload the sledges and carry their luggage themselves. At last, towards the evening of the third day they came to a pass over the top of the ridge; this was over a snow-covered plain over four thousand feet above sea level. The weather was still dull, the crest was completely overhung by grey clouds and the expedition advanced through a mist that hid everything to within a hundred yards of them.

They were all vexed by this as, had the weather been good, they would have had an extensive view from the top of the ridge which would have enabled them to complete a map of a large part of Nansen Land.

They set up a second store-dump in the pass, and left in it the geologists' specimens collected on the southern face of the ridge. All the zoologist had acquired were the skin and skull of a musk-ox;¹ the expedition had come upon a small herd of these creatures on the threshold of the pass.

IX

AN ENDLESS DESCENT

THE northern side of the ridge was a snow-covered expanse sloping gently and interminably northward, and the dogs dragged the sledges down this slope without difficulty. But the weather worsened, a persistent south wind blowing up dense, low-hanging clouds which completely hid what lay ahead. There were frequent falls of snow, but as they had the wind behind them and the frost was not more than 15 degrees the explorers could continue on their way without serious difficulty. Crevasses

¹ Musk-ox—a mammal which combines features of the sheep and the ox; it has short horns growing down and forward from the sides of its head, a long, thick coat, and broad hoofs which enable it to run swiftly over the ice and frozen snow. Nowadays it is found only in Greenland and in the North American islands beyond the 60th parallel.

occurred rather frequently now, but were narrow enough to cross without danger. But the fresh snowfalls completely hid these hazards and forced the party to go very carefully. When the day ended a blizzard was blowing so hard that it was a great effort to pitch the tent.

Next morning they found that their tent was buried to the roof in snow and when Borovoy—who got up early to make meteorological observations—opened the flap, he thrust his head into a snow-drift. They had to dig themselves out, only to find that the sledges and all the dogs had disappeared—nothing was visible but huge snowdrifts piled up around the tent. They deduced that both sledges and dogs were buried under the snow, since it was unthinkable either that the former could have been stolen or the latter could have run away in this snowy waste. They all began to dig away the snow.

When the dogs heard the men's voices they began scratching their way out of the snowdrifts, impatient for their morning ration. It was amusing to see the snow rising in bumps from which popped shaggy heads, black, white, or parti-coloured, uttering joyful yelps.

The fresh snow lay on the boundless plain in a thin layer, piling up in drifts around obstacles such as the tent, the sledges and the dogs. As it had fallen while a strong wind was blowing it was not very dense, and the men on their skis did not sink very deeply into it, but the sledges and dogs got stuck. They had to change places frequently, as the front sledge, which cleared the way for the rest, had a very hard task, and the dogs pulling it soon grew tired. These change-overs, together with the friable state of the snow, prevented them from moving very fast; and, although the wind had abated and the snow ceased falling, and although the way led downhill along an even incline and the crevasses were packed with snow, by the end of the day they had only managed to cross fifteen miles. They stopped at a point thirty-five miles from the pass, and here they set up their third store-dump.

That night the snowfall began anew, as heavy as before, and next morning they had to dig themselves out again, though this time from shallower drifts. Now the layer of fresh snow on the great plain was nearly three feet thick, and movement became more difficult; as a result, though they covered no more than ten miles that day they were all so tired out that they retired

to bed earlier than usual. The landscape and the weather were as depressing as ever.

That evening the snow stopped falling and through the clouds, which, as before, hung down nearly to the surface of the boundless expanse of snow, they could occasionally glimpse the sun, low on the horizon. The scene before them was wholly fantastic; a white plain with grey clouds rapidly gliding across it in wreaths and wisps that were continually changing shape; columns of tiny snowflakes whirling in the air, and, now here, now there, amid this shifting white and grey haze, bright pink gleams from rays of the sun which like a red ball, now appeared, now disappeared behind a grey veil. After supper, the explorers spent a long time enjoying this spectacle, until fatigue drove them into their tent and their sleeping bags.

On the third day the fall of the barometer showed that they were already at sea-level, but the plain continued to slope downhill towards the north.

When Borovoy, after recording the barometer reading, reported it to his companions, Maksheyev exclaimed:

"What can this mean? We've been going down and down since we left Russian Ridge, without meeting a single ice-chute or a single crevasse!"

"What is more surprising," remarked Kashtanov, "is that here there ought to be the shore of a sea, and the end of the huge icefield which descends from the northern slope of that ridge and which is forty-five miles long according to our calculations. According to what we know of the edge of the Antarctic continent, there should be a wall of ice a hundred yards high here, and at its foot either the open sea or at least a field of ice-hummocks and polynias,¹ with some icebergs among them. For as the glacier moves on it pushes into the sea-ice."

But the following day brought no change. The snowy plain continued as before, with the same northward descent; the wind blew steadily in the explorers' backs, as though hurrying them onward; low clouds swirled about them and from time to time dropped snow. They all expected that the downward slope would soon come to an end and hurried on, gazing ahead in hope that a change of incline was near. But they continued in vain onward hour after hour, until forced by weariness to halt for the night.

¹ Polynias are patches of unfrozen water amid icefloes. (Trans.)

When they had pitched their tent, they crowded round Borovoy as he set up his mercury barometer; they all wanted to see what it would read, as the hands of their pocket aneroid barometers had already reached the limit of the divisions on their dials and so did not show the pressure properly.

"At a rough estimate we have already gone down twelve hundred feet below sea-level," exclaimed the meteorologist, "unless there is a great anticyclone over Nansen Land at this moment. The barometer shows eight hundred millimetres."

"So far as I know," Kashtanov observed, "anticyclones of such pressure don't exist on earth. Besides, the weather hasn't changed since we left Nansen Land and it's not at all like anticyclonic weather."

"But anyway, where are we?" Papochkin exclaimed.

"Evidently we haven't come to the end of the land, and its northern part is a very deep depression, a hollow extending hundreds of yards under the sea."

"But is that possible?" asked Gromeko.

"Why not? There are similar depressions known to us, such as the rift valley of the Jordan and Lake Baikal in Siberia, where the bottom is three thousand feet and more below sea level."

"The Dead Sea is a deep depression too, 1,300 feet below ocean level," Maksheyev added.

"In any case, the discovery of such a deep depression in the Arctic will be an extremely interesting and important result of our expedition," said Borovoy, concluding the discussion.

Next day, to their amazement the descent continued across the plain, in the same weather.

"We've got into some bottomless pit," Maksheyev laughed. "It's not just a flat plain, it's a funnel—the crater of an extinct volcano, perhaps?"

"But bigger than anything else on Earth," observed Kashtanov. "We've been going down into this funnel for four days, and the diameter of the crater must obviously be a hundred and eighty miles or more; such huge volcanoes are only known on the moon. Unfortunately during the whole of our descent we have not come across a single cliff-face, nor the slightest outcrop of rock that might have shown the origin of this depression. The slopes of a crater should consist of different kinds of lava and volcanic tufa."

"We did see basalt and basaltic lava on the northern slope and crest of Russian Ridge," Papochkin recalled. "But there is no sign that this depression is of volcanic origin." "In Alaska there are craters of extinct volcanoes full of snow and ice," Maksheyev added.

That evening the mercury barometer ceased to function: the mercury rose to the very top of the tube; they had to resort to using a hypsometer¹ and determining the air pressure by the temperature at which water boiled. It corresponded to a depth of two thousand five hundred feet below the level of the ocean.

Everyone noticed that towards evening it became a little warmer, though the rays of the midnight sun obviously did not penetrate directly into this deep cavity. The explorers were even more perplexed that day when the compass ceased to function; its hand whirled round, and would not settle down. They had to take their direction northward from the wind and the general gradient of the plain. Kashtanov put down the disturbance of the compass to the volcanic nature of the depression, as it is well known that large masses of basalt affect a magnetic pointer.

On the following day, however, the explorers met an unexpected obstacle a few miles from their night's resting-place: the snowy plain came to an end where a chain of ice-covered cliffs stretched to right and left as far as eye could see. In some places the cliffs rose sheer to some forty-five feet, in others they were a mass of lumps of ice, heaped one upon another. It would have been hard to clamber over those heaps even without loaded sledges. They were forced to stop and reconnoitre. Maksheyev and Borovoy scrambled on to the highest of the heaps and found that similar masses of rock and cliffs stretched ahead of them as far as they could see.

"This doesn't look like a belt of hummocks of sea-ice," said Maksheyev when he came back to the sledges. "Ice-hummocks don't extend for a width of several miles without a break."

"We've evidently reached the bottom of the depression," said Kashtanov, "and this chaos is caused by the pressure of the

¹ A hypsometer consists of a vessel for boiling water with a long tube in the lid in which a thermometer is stood, so as to determine the boiling point of water by means of the steam exuded.



A chain of ice-covered cliffs stretched to right and left as far as eye could see.

huge glacier on the northern slope of Russian Ridge which we've been coming down."

"Then the entire bottom of the depression is occupied by blocks of ice," Borovoy remarked. "Its other slopes must also be covered with glaciers descending to the bottom."

"And thanks to the colossal size of the depression it has not yet been filled up with ice, as the craters of the Alaskan volcanoes have been filled," added Maksheyev.

"But somehow or other, we have to get across this bottom, so as to continue our journey to the north and discover the size of the depression and what the opposite slope is like," added Kash-tanov.

"It would be easiest to follow the edges of this chaos so as to get round it to the opposite slope," suggested Gromeko.

"But suppose this depression is not the crater of a volcano but a valley between two ridges?" said Papochkin. "If it is, this may go on for sixty miles or so and we shall never manage to get across Nansen Land."

"And should we go, right or left, along the edge of the chaos, to get round it?" asked Borovoy.

"Let's go to the left; perhaps we'll find some place where we can cross the chaos without too much difficulty."

The explorers turned off to the left, that is, to the west, judging by the wind, as the compass was still useless. The snow-covered plain sloped slightly away to their left, while the heaps and cliffs of ice loomed up on their right; low clouds covered the sky and even touched the highest peaks of ice. About midday they noticed a place where the chaos seemed passable; the heaps of ice were lower and gaps could be seen in places. They stopped here to set up their fourth store-dump, and Borovoy and Maksheyev left their luggage and set off into the ice-belt to investigate. Towards evening they came back to report that the belt was nearly six miles wide, that it could be crossed, though not without difficulty, and that the opposite side of the depression sloped away upward beyond it.

It took them two day's hard work to cross the zone of chaos; they often had to hack a path through heaped-up blocks of ice so as to be able to drag the sledges through, by the combined efforts of men and dogs. They did not pitch their tent but spent the night sheltering from the wind behind an enormous perpendicular block of ice; the dogs hid in cracks and hollows

among the debris. However, they all slept soundly, after their arduous labours in spite of the moaning and howling of the wind through the chaos.

Next day they came out on to the far side of the barrier. At the place where they spent the night Borovoy had lit the spirit-stove of his hypsometer, confident that it would show the same height as before they arrived at the belt of ice, i.e., about two thousand five hundred feet below sea level. But when he placed the thermometer in the tube of the little boiler, the mercury rose to 220, then to 230, and still kept rising.

"Stop, stop!" Borovoy exclaimed. "Do you want to smash the glass?"

"What's happening? What's up?" cried his companions.

They all gathered round the instrument, which stood on one of the trunks.

"This is extraordinary, unheard of!" Borovoy exclaimed, choking with excitement. "Water boils in this damned hole at a temperature of 248 degrees."

"And that means . . .?"

"That means that in crossing the ice-belt we have been descending into an abyss. I just can't think how many thousands of feet below sea level we must be for this to be the boiling point. Wait a bit, I'd better look up the table."

He sat down on his sleeping bag, pulled out his manual for calculating heights, rummaged about in the tables and began working something out in the margin. Meanwhile, his companions examined the instrument to convince themselves that the thermometer really did show 248°. The gleaming column had stopped at that mark and there could be no doubt about it.

The silence was broken only by the gentle bubbling of the water boiling in the apparatus. Then Borovoy, after a deep gasp solemnly announced:

"At a rough calculation, this boiling-point—round about 248°—is equivalent to a depth of twenty thousand feet."

"Impossible! Haven't you made a mistake?" they chorused.

"Check it for yourself. There are the tables. Of course, there are no data in them for such a boiling point, which has never been observed except in a laboratory, and so I've had to work it out approximately."

Kashtanov checked the calculation and said:

"You're quite right. During the two days that we've been clambering across blocks of ice we've gone down fourteen thousand, five hundred feet in about six to eight miles."

"But we didn't notice that we were going down like that!"

"We've gone down lower than the height of Mont Blanc and none of us knew! It's incredible!"

"And incomprehensible! The only explanation is that the chaos of ice is an ice-chute down a steep cliff face which leads from the crater into the orifice of a colossal volcano."

"From which we shall now have to climb out by a similar ice-chute on the other side!"

"I simply can't understand this dense cover of cloud nor this wind that's been blowing from the south for so many days without a break," said Borovoy.

The supposition about a second wall of ice was not confirmed. The following day their route lay across a snowy plain with a slight upward slope; this and the warm weather made progress more difficult. The thermometer had risen a little above freezing-point, the snow became slushy and stuck to the runners of the sledges, the dogs dragged themselves along at walking pace. By evening they had covered fifteen miles with difficulty. There could be no doubt that the ground was rising, and when Borovoy set up his hypsometer he was sure that it would show a depth less than that of the previous day.

But the water would not boil for a long time; at last steam appeared, and Borovoy inserted his thermometer. A moment later he cried out:

"The devil only knows what's going on! It's . . . it's . . ."
And he broke into curses.

"What's the matter? Has the thermometer burst?" asked his companions.

"I shall burst myself, or else go mad, in this hole!" the meteorologist raved. "Look for yourselves; which is crazy, me or the thermometer?"

They all jumped up and approached the hypsometer. The mercury showed 257°.

"Did we go up today or did we go down?" Borovoy asked in a trembling voice.

"We went up, of course. We've been climbing all day long. No doubt about that!"

"And yet water boils at nine degrees higher than yesterday

when we were in the ice-barrier. And that means that we didn't rise today, but descended about four thousand, two hundred feet."

"And so now we are twenty-one thousand, two hundred feet below sea level," Maksheyev rapidly calculated.

"But that's unthinkable?" laughed Papochkin.

"It was possible to believe that we made a sharp descent when we crossed the ice," said Kashtanov; "but to believe that we have gone down nearly a mile when our route has obviously taken us upward, why, it doesn't make sense."

"Assuming that we're not all suffering from some collective madness, I agree with you!" replied Borovoy gloomily.

At that moment Gromeko and Igolkin, who had left the tent to feed the dogs, came back, and the former said:

"Another strange thing—it's considerably brighter today than it was yesterday when we were in the ice."

"And yesterday it was brighter than when we were on the other side of the barrier," added Maksheyev.

"Quite right," the meteorologist confirmed. "The darkest night we've had, something like a St. Petersburg white night, was just before we came to the ice-barrier. We thought we were at the bottom of the depression, and so it was understandable that the light should be so feeble: the Arctic sun couldn't penetrate so far down."

"But now we have gone very much farther down and yet the nights are much lighter!"

They spent a long time discussing these contradictory facts, but eventually went to bed without having clarified them. Next morning Borovoy was the first to leave the tent, to carry out his observations.

The wind was blowing, as before, from the south, and bringing with it the same low, grey clouds which hid the landscape at a distance of about a hundred yards. The thermometer showed 30° and snow was falling.

"Today we must test whether we are going up or down," said Maksheyev. We have a level and a surveyor's pole among our instruments."

The same snow-covered plain stretched before them, but the snow was slightly frozen and progress was easier. The gradient was not steep, but there could be no doubt that it was an upward one, and several levels taken in the course of

the day corroborated what their eyes told them and what the dogs showed by their gait.

During that day they covered only fourteen miles, as taking the levels occupied quite a lot of time.

As soon as the tent was pitched, Borovoy took out his instruments; the boiler showed 263° .

Borovoy cursed in style, and spat.

"The only possible explanation is that the physical laws which apply on the earth's surface simply don't apply in this abyss, and we'll have to work out new ones," said Kashtanov.

"It's easy to talk about working them out," growled Borovoy. "You won't work them out in a hurry. Hundreds of scientists have toiled for years, but all their achievements are useless here, as though we were on another planet. I can't accept it and I'm ready to hand in my resignation."

Everybody roared with laughter at the meteorologist's outburst. In spite of it, he applied himself to working out the figures, and declared that during the day the explorers had risen, that is to say, had descended, five thousand eight hundred feet, and were now twenty-seven thousand feet below sea level.

"I've looked up the physics manual," Kashtanov observed. "Apparently, water boils at 248° when there is a pressure of two atmospheres and at 275° when there is a pressure of three atmospheres. So now we must be experiencing a pressure of about two and a half atmospheres."

"It's not surprising that under such pressure you feel queer and your head goes round and round," was Borovoy's gloomy comment.

The others agreed that ever since they had spent the night in the midst of the ice-barrier they had been feeling unwell—chesty, head-achy, heavy-limbed; they had slept badly and had nightmares.

"And the dogs were out of sorts, too," remarked Igolkin. "They seemed to get weaker and pull less well, although the ascent was not so steep. I thought they were just tired, but this is what was troubling them."

"It would be interesting to take everyone's pulse," suggested Gromeko. "What's yours, normally, Ivan Andreyevich?"

"Seventy-two," replied Borovoy, holding out his wrist to the doctor.

"Well, now it's forty-four! Quite a difference. The heart works

slower under such pressure and that affects your general state."

"Suppose we were to go on descending, would our hearts stop altogether?" asked Maksheyev.

"Well, we're not going to descend to the centre of the earth!" laughed Gromeko.

"And why not?" muttered Borovoy.

"This miraculous funnel possibly does reach to the centre of the earth. I'll believe anything now. I shan't be surprised even if we find ourselves amid the ice around the South Pole when we come out of this!"

"Pardon me, but that's absurd," observed Kashtanov. "There can't be a hole all the way through the earth nor a funnel reaching to the centre. It would contradict all the findings of geophysics and of geology."

"I like that! Yet you accept all the facts we've observed that contradict the laws of meteorology. Just you keep your eyes open, and the laws of your geology will turn somersaults too."

Kashtanov laughed.

"Meteorology is a frivolous science," he said banteringly. "The atmosphere, with which it is concerned, is most unstable. But geology has a firm foundation—the hard crust of the earth."

"A firm foundation!" exclaimed Borovoy, in fury. "Until it's jolted by a nice little earthquake, when any geologist loses his head, even if nothing worse happens to him."

Everybody burst out laughing.

"And what's more," the meteorologist went on venomously, "your knowledge only goes a mile or two below the surface; what do you know about the interior of the earth? There are as many hypotheses about that as there are geologists. Some think the kernel of the earth is hard, some think it's liquid, and others believe it's gaseous. Just try to sort it out!"

"We'll sort it out in time. Any hypothesis, if it has some foundation, is a step towards discovery of the truth. And you're wrong about the earth's interior. Seismology is already teaching us about the kernel of the earth."

"It's interesting to speculate about tomorrow," he added. "Each day now we can count on meeting new facts which will be difficult to understand at first, but will form a single chain of cause and effect in the end."

Next day the snow-covered plain was there before them again, but the slope was not so steep; as before, the wind blew from the

south, low clouds rolled and drifted almost at ground level, hiding what lay ahead. In the afternoon the plain scarcely sloped at all and towards evening it began to descend; the dogs ran faster, so that the skiers could hardly keep up with them. The temperature kept at a little below freezing-point, and the ground was easy. Suddenly Borovoy, who was marching in front, waved his arms and shouted:

"Stop, wait! I'm afraid we've lost our way."

Everybody hurried up to him. He was gazing fixedly at the compass.

"What's up?" asked Kashtanov.

"We're going not northward but southward, back towards the ice-belt. Look, the north end of the pointer points not ahead, the way we're going, but back."

"When did you notice this?"

"Just now. Since the compass started to act queerly I've stopped relying on it and have been guiding the convoy by the wind, which has kept steadily blowing from the south. But I've got confused by the opposite slope of the plain, because we can't have emerged from the funnel yet. I took out the compass and saw that it had stopped acting strangely and was showing the direction we are going as south, not north."

"But the wind is still blowing against our backs."

"It may have changed during the night."

"No," said Maksheyev, "the wind hasn't changed. We've kept pitching the tent with the flap away from the wind, that is, to the north, so as not to have a draught. This morning, I remember quite definitely, the tent was still facing away from the wind."

"Then it must have changed gradually during the day; we've made a semicircle and now we're going back."

"Or else the magnetism of the compass has somehow got reversed."

"If only the sun would shine through or stars come out, so that we could check where we're going," Borovoy said plaintively.

"Well, anyway, we'll have to stop for the night and then check back a few miles of our route with the compass. We shall be able to find the way quite clearly by our tracks in the snow," said Kashtanov. "If we've been curving round we'll soon know."

When they had pitched their tent, Maksheyev and Gromeko

hurried back along the track they had left. Borovoy got his hypsometer boiling, and it showed nearly the same as the day before. They had made up for the slight upward slope crossed during the first part of the day by the descent during the second part. Two hours later the trackers returned; their checking of six miles showed they had kept a straight route thanks to the wind. They decided to continue to go by the wind, which appeared more trustworthy than the compass.

Once again the night was not dark at all, and the wan light from behind the clouds did not vary.

Next day the downward slope of the terrain became more pronounced. The temperature rose a little above freezing point, the snow turned into slush, and so the road grew more difficult in spite of the downward slope. In the afternoon, puddles and small brooks appeared, meandering over the ground and disappearing into snowy crevasses. For their camp that night they had to choose raised ground, and to dig trenches round the tent to carry off water formed by the melting snow.

When he set up his hypsometer, Borovoy was sure that it would show a still higher figure, since all day long they had been going downhill into the depths of the mysterious depression. But the thermometer showed 256° , and the negative height of the locality, in spite of the descent, had not increased but decreased by one thousand, seven hundred feet. The meteorologist, utterly nonplussed, gave a nervous laugh.

"Another queer thing! This morning we decided not to believe the compass, now we'll have to suspect the hypsometer, too."

Once more all the explorers gathered round the wayward instrument, checked its recording, boiled the water again and again, but the result remained the same. In spite of the obvious descent, which none of them could doubt since the streams were flowing in that direction, the air pressure had not increased but decreased. During the preceding days, on the contrary, when they had been going uphill, the pressure had not decreased but increased. It seemed that the laws governing physical phenomena, worked out by generations of scientists on the basis of observations made on the earth's surface, did not apply in this depression in the Arctic continent, or else meant something completely different. Inexplicable phenomena were becoming more numerous.

They were all interested and disturbed, but nobody could

understand or explain what was happening. They could only hope that they would very soon find the key to the mystery.

"What a desert of snow this is," Papochkin remarked. "After we met the musk-oxen in the pass before the crest it seemed something might have turned up to interest Mihail Ignatyevich and me, yet we've been travelling for twelve days since then, and covered more than a hundred and fifty miles . . . and there's absolutely nothing but snow and ice."

"And even Pyotr Ivanovich—who was the luckiest of us up till then—has not found anything for his collection," added Gromeko.

"Ivan Andreyevich is the only one who's collecting material," observed Maksheyev, with a grin.

"I? And what have I collected all this time?" asked Borovoy, in surprise.

"You've collected a lot of inexplicable phenomena," Kash-tanov put in, guessing what Maksheyev was getting at.

"It's a very unusual collection, that's true, but rather a lightweight one, not like your stones," laughed Borovoy "It won't weigh our sledges down."

"But you can look on it as a very weighty result of our expedition. After all, every researcher wants to find something special and new. Up to now you've been luckier than we have."

Next day the descent continued, becoming even more marked. The ice-covered plain began to break up into flat-topped mounds, with streams between them. The snow melted, and it was hard for the men to advance on their skis, which skidded and swerved. So they changed their method of travel: the men sat on the sledges, two to each and the dogs pulled them rapidly down the slope; they steered the sledges with their ski-sticks, and also used these to keep themselves from overturning when crossing bumpy places in the ice.

They noticed that the clouds, which still clung to the ground, were now not grey but reddish in colour, as though lit up by an invisible setting sun.

The icy waste stretched away on all sides to the horizon, which also had a reddish tinge. This strange glow at the bottom of a deep depression, where the low Arctic sun could not possibly penetrate, was one more inexplicable phenomenon for Borovoy's collection.

They stopped for the day on the top of a hillock, near a

swift-running brook of clear water which saved them the trouble of melting snow for their soup and tea.

X

THE SUN'S INEXPLICABLE POSITION

SUPPER over, the meteorologist set up his boiling apparatus, confident that after the long and dangerous descent of twenty-seven miles the mercury would show at least 265° and the depth below sea level would be an all-time record of thirty thousand feet. He had even worked out in advance the heights corresponding to boiling-points between 265° and 275° . To his great astonishment the thermometer showed only 248° !

"I've made another addition to my collection," he said in a serious tone.

"You probably believe that today we were travelling very fast downhill all the time."

"Why yes, of course. Obviously. Water doesn't run uphill," they replied.

"Right. Well, the hypsometer shows that we've been going uphill and today we rose by five thousand one hundred feet and a little over. How do you like that?"

When they had all had a good look and seen that Borovoy was not joking, he observed:

"Evidently, if we keep on going down we shall soon emerge from this amazing cavity; perhaps at the North Pole itself."

"Personally *I* think some catastrophe is brewing," said Gromeko enigmatically. "An extraordinary rarefaction of the air is going on here, the pressure is falling, portending a hurricane, or cyclone or something of that sort. And so as to face it calmly, I propose that everyone with any sense gets into his sleeping-bag."

Everybody laughed, even Borovoy, and followed the doctor's advice. But the meteorologist first made sure that the tent-pegs were well knocked in and the ropes firm. He was really afraid

of some sudden atmospheric calamity; and slept uneasily, waking from time to time and listening to hear if the wind was growing stronger and the expected catastrophe beginning. But all was quiet, the wind blew as steadily as ever, his comrades were snoring, and the sleeping dogs growled and yelped. Borovoy lay down and tried to forget his troubled thoughts and get to sleep.

Next morning he was the first to leave the tent, so as to note the recordings of the instruments which he had hung up overnight. The other travellers were still in their sleeping bags.

Suddenly the felt flap of the tent was raised and the meteorologist entered with ashen cheeks and goggling eyes, and said, in a faltering voice:

"If I were alone I'd be certain I'd gone mad."

"What's up now? What's the matter? Has there been a disaster?" The questions were voiced fearfully by some, ironically by others.

"The cloud or mist has almost disappeared, and the sun—the Arctic sun, don't forget—is at the zenith!" Borovoy exclaimed.

They all rushed to the exit, getting in each other's way and dressing as they went.

A slight mist was drifting over the icy plain, and through it shone, now clearly, now dimly, a reddish disc which hung directly above their heads, instead of low on the horizon, where the Arctic sun should have been at five in the morning in early July on the eightieth parallel.

They all stood there, heads thrown back, staring up at this strange sun in the wrong place.

"This Nansen Land is a queer place," said Maksheyev in a half-tragic and half-ironical tone.

"Could it be the moon?" suggested Papochkin. "Perhaps it's full moon now?"

Borovoy groped in his pocket for his almanac.

"Yes, it is full moon now, but this red disc isn't like the moon—it shines brighter and it gives out appreciable heat."

"Perhaps in Nansen Land . . ." began Maksheyev, but Kashtanov interrupted him:

"Within the Arctic circle the moon is never at the zenith in the summer months; it's either quite invisible or else very low."

“But if it isn’t the moon and it isn’t the sun, what can it be?”

Nobody could find an answer. They all went on offering guesses and then refuting these guesses; after which they had breakfast and got ready to continue their journey. The thermometer went up to 45° . The mist sometimes grew thick, hiding the red luminary, and sometimes cleared, and then they saw it still at the zenith, never changing its position. Their path lay downward, as before, across the icy plain, along the bank of a large stream. The gradient seemed to have become gentler.

The dogs ran at a good pace, the explorers sat on the sledges, jumping off now and again to adjust the harness or make a little bridge across some deeper channel.

Whenever the sun pierced the mist they all gazed up at the strange orb occupying such an unnatural position in the sky.

They made their usual halt for lunch.

It was only their watches that told them it was noon, however, for the sun stood at the zenith just as before and seemed to have no intention at all of changing its place.

“The plot thickens,” grumbled Borovoy. “Even at the eightieth parallel the sun ought to shift around in the sky and not stay put. After all, the earth is revolving.”

During the lunch-halt he measured the angle of the sun, which turned out to be exactly 90 degrees.

“Anyone would think we were in the tropics at the summer solstice or on the equator at the equinox,” he said after completing his observations. “What latitude can I record? I simply can’t understand where we are or what’s going on around us. It all seems a sort of queer dream.”

At bottom they all shared Borovoy’s feelings and were quite unable to account for this new phenomenon, the mystery of which far exceeded all the others—the contradictory readings of the instruments, the constant wind from one direction, the dense clouds, the abnormal warmth, the reddish light and the colossal depression.

While they were eating and resting they made every sort of guess as to calamities which, since they had been cut off from the rest of the world, might have occurred on earth.

XI

THE ARCTIC TUNDRA

TOWARDS evening, instead of the snowy plain they found themselves crossing a range of ice-covered hillocks. The reddish sun, visible through a thin mist, still stood at the zenith, as though mocking the explorers who stared at it with amazement. It was nearly time to stop for the night. Although there was enough space, an icy crest was not a very convenient halting place, for the water was a long way below and they could not get down to it by the smooth ice-covered slope. So they continued their journey in the hope of finding a better place, as, through the mist, they could see a sort of dark plain ahead of them.

At about seven in the evening, the icy mounds grew lower and eventually became flat white tongues, like giant scallops, marking the edge of the dark plain; into this the brooks flowed in shallow channels and ran off between level marshy banks. The sledges, which had been rushing across the ice, stuck in the muddy, open ground, and the dogs refused to go on. The explorers jumped down from the sledges: they had travelled the last half mile in strained anticipation of a fresh surprise in the form of a plain free from snow.

As though by common agreement they bent down to examine and feel this earth for which they had longed through so many days of snow and ice. It was brownish-black, saturated with water, sticky, but not completely bare; and it was covered with stunted blades of yellowish grass and the twisted, creeping branches of squat leafless bushes. Their feet sank into the ground, and little streams and fountains of yellow water spurted where they trod.

"How do you like this?" muttered Kashtanov. "On the eighty-first parallel snow disappears, it's as warm as in Finland, the earth is exposed and the sun is at the zenith!"

"Surely we can't pitch our tent in this marsh?" demanded Papochkin morosely.

"It isn't marsh, it's the northern tundra," said Maksheyev.

"That doesn't help matters," observed Borovoy. "The dogs are refusing to drag the sledges, and it's not going to be very

nice, you know, spending the night in this mud. It would be better to go back to the ice."

They all began looking around for a drier spot.

"Look, we should be all right over there, I think," exclaimed Gromeko, pointing ahead to where a flat-topped hillock rose above the black-brown plain, about half a mile from the tongues of ice.

"But how are we going to get the sledges so far?"

"That's all right, we'll drag them across—we'll give the dogs a helping hand."

"Let's try to get our skis on, so as not to sink so far in."

It really was easier to get along on skis. The dogs slowly dragged the sledges, somewhat lightened of their load, and the men pushed from behind with their ski-sticks. In half an hour they had reached the hillock, which rose about twenty-four feet above the plain and made a dry and comfortable place for their night's camp. Fresh green shoots were appearing on its surface amid last year's yellowed grass, and the squat bush was burgeoning.

They pitched their tent at the top of the hillock, leaving sledges and dogs lower down. Behind them, to the north, the edge of the ice stretched gleaming white in a high, level bank, from one end of the horizon to another; in front the black-brown plain already had a greenish tint.

Fifty paces from the hillock a broad stream flowed noiselessly between marshy banks. Mist rolled across the plain.

From time to time the reddish sun appeared—still at the zenith—though their watches showed it was half past eight in the evening. They had covered thirty miles that day.

While Borovoy boiled water, the rest made guesses at the boiling-point which the instrument would show after such a long and obvious descent.

Some guessed 255°, others 240°. Maksheyev even took a bet on it with Papochkin.

"Neither of you has won," declared the meteorologist, when he had finished his observations. "The thermometer shows only 230°."

"Still, I was nearest," said Maksheyev; "I said 240°."

"Don't you think all these useless instruments should be chucked away?" asked Borovoy bitterly.

"You take these tricks of the atmospheric pressure too much

to heart," said Kashtanov soothingly; "just as though you considered yourself responsible for them."

"That's not the point—when an instrument's useless there's no use dragging it around."

"It mayn't be any good at the moment, for some unknown reason but further on in our journey it will probably be useful again."

After supper they discussed the next stage of their travels. If the snow-free tundra stretched even further to the north, much of their equipment would prove not merely useless but even a nuisance and would slow down their movement—they could dispense with skis, sledges, the dogs and the animals' food, the spare warm clothing, a good deal of the alcohol, and even their felt tent. In the warm weather which prevailed here they could be comfortable in a lighter tent which they had among their stores, and they could gather firewood in the tundra.

So they decided to camp for a day on the hillock and divide into two groups which would set out unburdened in different directions, so as to get an idea of the nature of the terrain and future travelling conditions. After this they would dump everything unnecessary on the hillock to await their return journey across the ice.

XII

THE WANDERING HILLS

NEXT day Igolkin and Borovoy stayed by the tent: the former to look after the dogs and the latter to make meteorological observations. The other four set off on reconnaissance, in two groups: Kashtanov and Papochkin went south-east, Maksheyev and Gromeko south-west. They all went on skis, but with the intention of taking them off if the soil became dry enough.

Each of the explorers was armed with a rifle. It was unthinkable that they should not meet more wild life in the tundra

than in the snowy plain. The dogs' restless behaviour during the night led them to expect that they would encounter animals of some kind. Both they and the dogs badly needed fresh meat.

Kashtanov and Papochkin soon came to a broad stream, beyond which the tundra continued.

Soon the tundra became so dry that they had to take off their skis for good and all. They piled them, tying them together at the top, so as to be able to spot them better and pick them up on the way back.

The dry tundra was already green with young grass, and here the squat bush was covered with green leaves and flowers. Mist rolled across the plain, with a very fine rain falling in places. Through gaps in the mist the reddish sun shone and gave out a perceptible warmth, but its disc could still not be seen very distinctly.

About six miles from their camp the travellers noticed several steep-sided hillocks ahead, dimly outlined in the mist.

"What a splendid place for surveying the country when the mist clears!" exclaimed Papochkin. "On a flat plain like this it should be possible to see a long way from one of those hillocks."

"The rocks we shall find on them should be even more interesting," retorted Kashtanov. "Up to now our geological finds have not amounted to much."

"And the zoological material to still less."

"Well, now the tundra will compensate us. From their shape and colour these hillocks seem to be mounds of basalt or some other volcanic rock."

Both the explorers hurried down towards the object of their interest, which they sometimes saw, sometimes lost sight of in the enshrouding mist.

Kashtanov and Papochkin hurried along for over a quarter of an hour, but the dark hillocks seemed almost as far off as they had been at first sight.

"This damned mist makes it terribly hard to judge distance," said the zoologist, stopping to take breath. "I was sure it wasn't far to those hillocks, yet we've been running and running and hardly got any nearer. I'm out of breath."

"Well, then, let's have a rest," Kashtanov concurred. "The hillocks won't run away."

They stood still, leaning on their rifles. Suddenly Papochkin, after glancing in the direction of the hillocks, exclaimed:

"What an extraordinary thing—unless it's an optical illusion! I thought I saw our hillocks move."

"It's the mist creeping along that makes you think so," answered Kashtanov calmly, lighting his pipe.

"No, now I can see plainly that the hillocks *are* moving! Look, quick!"

Ahead of them and not far away they could clearly see four dark masses slowly moving across the tundra.

"Hillocks of basalt or other volcanic rock usually stay in one place," observed Papochkin sarcastically. "Still, in this land of inexplicable phenomena perhaps even such hillocks wander from place to place. What a pity Borovoy isn't with us!"

Meanwhile Kashtanov had taken out his field-glasses and trained them on the moving hillocks.

"And, do you know, Semyon Semyonovich," he said in a voice quivering with excitement, "these hillocks are in your line of country, not mine—they are big animals, something like elephants—I can see their long trunks quite clearly."

They hastened forward again, stopping only when the mist cleared; the dark masses were now much nearer.

"Let's lie down," said the zoologist; "otherwise they may spot us and run away."

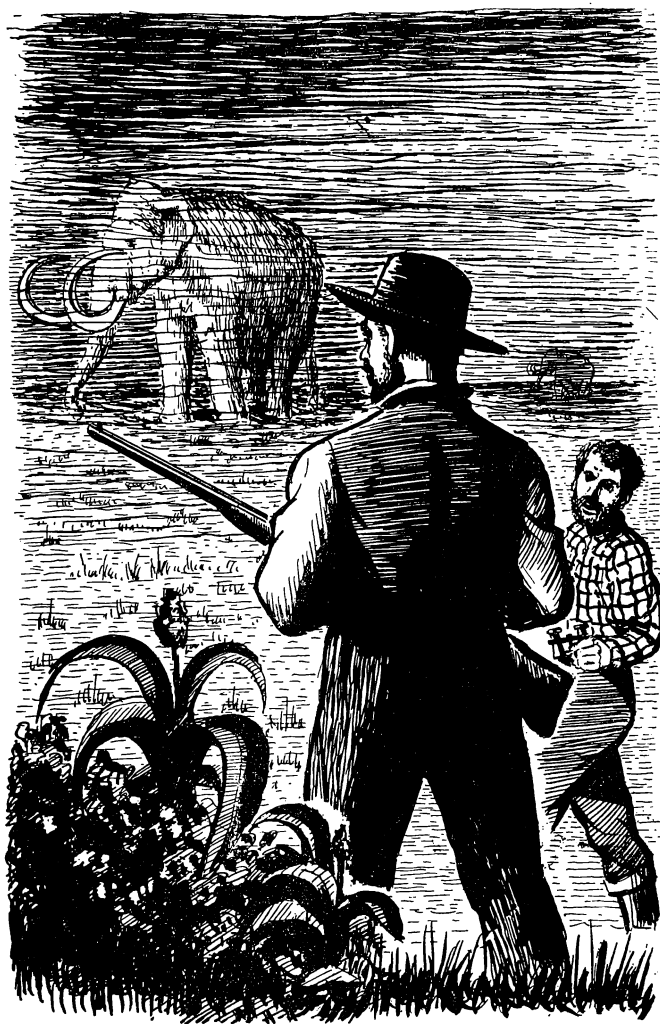
They flung themselves down on the tundra. Papochkin kept the field-glasses to his eyes, waiting for a propitious moment. At last the mist cleared enough for them to make out distinctly, some four hundred paces away, four elephant-like creatures plucking small branches from the creeping bush and placing these in their mouths with their trunks. Three of them were bigger than the fourth.

"Enormous, sharply-bent tusks," said Papochkin. "Bodies covered with reddish-brown hair. Little tails which they flick about gaily. If I didn't know that mammoths were extinct I should have said these were not elephants but mammoths."

"But perhaps even mammoths roam about in this country of surprises!"

Meanwhile, Kashtanov was loading his long-range rifle and aiming at the nearest of the beasts, which presented its left flank to the hunter.

There was a deafening report. The beast waved its trunk and fell forward on its front knees, then jumped up, ran a few steps and collapsed heavily to the ground.



Elephant-like creatures plucking small branches from the creeping bush.

The others shied away from it and then, lifting up their trunks and bellowing like bulls, they trotted heavily across the tundra, and vanished in the mist.

Kashtanov and Papochkin, burning with impatience, rushed towards their quarry. The creature lay on its right side, its legs stretched out and its head, with huge tusks, flung back. A stream of blood was flowing from the gaping wound beneath the shoulder blade; the round belly still panted convulsively, and the trunk twitched.

"Go carefully," said Kashtanov. "In its death-agony it could lash out with its trunk or kick violently enough to break our bones."

The hunters stopped about ten paces from the elephant and from there examined it with understandable excitement and interest.

"I think it's a mammoth too," said Kashtanov. "Its monstrous size—why, the great hulking thing is eighteen feet long!—its tusks, twisted upward and inward, and its long reddish hair are characteristic of the mammoth. Besides, elephants have never been found in the Arctic, but mammoths did live in the Siberian tundra."

"If I hadn't seen it with my own eyes, I should never have believed it," Papochkin said. "What a discovery!"

"Well, it's no more remarkable than this deep cavity as a whole, and green tundra in this latitude—80° North. Evidently, mammoths have survived till today on this Arctic continent, cut off by the ice from the rest of our planet and enjoying a mild climate. They are like living fossils."

"Or prehistoric animals adapted to new conditions of life. It's clear that Nansen Land was formerly not cut off by ice and snow, but had the same flora and fauna as North America and Northern Asia. And, perhaps during the Ice Age, the mammoths found a last refuge here."

"And our expedition has discovered that now! But what are we to do with this monster? We should need a flatcar and a locomotive to get it back to camp."

"If the mammoth can't go to the camp, at least the camp can be shifted to the mammoth," laughed the zoologist.

"That's an idea. But if there are mammoths wandering about the tundra there may be bears, wolves, polar foxes too—all sorts of beasts of prey. And while we're moving camp to this spot they'll carry off our spoil."

"That's true. We must measure the mammoth, photograph it and write a description of it at once. We'll preserve a tooth, and parts of the brain, the hide and the flesh, in alcohol, and take them back to the *Pole Star*."

"I think we must cut off the trunk, at any rate, to show our friends. A nice surprise for them! And then we'll eat it—that'll be a dish no naturalist ever enjoyed before! They say elephant's trunk is delicious. But we must keep the tip of the trunk, because that has never been found on a mammoth's carcass before and nobody knows what it was like."¹

The hunters approached the mammoth, which lay motionless, and set about measuring and thoroughly examining it.

Papochkin did the measuring, while Kashtanov wrote the figures down; then the latter photographed the carcass from various angles, while the zoologist proudly stood beside it or climbed on top to show the scale. He exclaimed:

"What a marvel, eh? We'll have an illustration for the report of our expedition—the well-known scientist Papochkin mounted on the carcass of a mammoth, and not a fossil either, but only just dead!"

When they had finished this job, the explorers cut off the tail, the trunk and a hank of long hair, and took up their rifles; they were about to go back to the tent when the zoologist, looking confusedly around him, cried.

"But which way is our camp? I can't see the horizon for all this tundra round us, and the mist coming up. We're lost, Pyotr Ivanovich. I really don't know which direction we should take. . . ."

Kashtanov was a little put out by this outburst, but then said, smiling:

"So long as you have a compass, you can't get lost even in a fog, if you know the direction you've been following. When we left camp we went south-east, so now we must go north-west."

"But when we saw the mammoths I think we ran forward without paying any attention to the compass."

"No, before I put the compass away I noticed which way we were running—from force of habit. Don't worry, I'll lead you back to the tent."

¹ In the last decade a mammoth's trunk was found on the Chukot Peninsula and the tip of it sent to the Academy of Sciences.

Compass in hand, Kashtanov set forth confidently across the tundra, followed by the zoologist.

For two hours they walked across the plain. The mist hung low, as before, occasionally clearing enough for them to see half a mile or so around. At one such moment Kashtanov saw a strange object sticking up out of the plain ahead of them. He pointed it out to the zoologist.

"What is it?" asked the latter. "It looks like the skeleton of a Samoyed tent. Can there be people here?"

"I think it's our skis. You've forgotten that we piled them."

"Well, that means we're going in the right direction."

When they came up to their skis the explorers had no need to worry, and could put the compass away, for the tracks left by the skis were clearly visible on the damp surface of the tundra. Soon the hillock with their tent appeared on the horizon.

XIII

AN UNINVITED GUEST

WHEN the hunters were near enough to the hillock to see the men and dogs as well as the tent, Kashtanov remarked to his companion, whose sight and hearing were less keen:

"There's something wrong in our camp—the men are running about and the dogs are barking like anything."

They both stopped to listen. They distinctly heard a furious barking, followed by a shot, then another, then a third. . . .

"Have some mammoths or other fossil beasts attacked them? I'm quite ready to believe that could have happened, now!" said the zoologist.

"We must hurry there—they may need help urgently."

They went ahead as fast as their burdens and their weariness would let them. On reaching the hillock they took off their skis, dumped the mammoth's trunk, and were at the top in a flash.

The dogs were barking as they tugged to get free of their leashes; there was nobody in the tent. But on the far side of the hillock they could see a dark shape with Borovoy and Igolkin standing beside it, guns in their hands.

In a moment Kashtanov and Papochkin had joined them.

"What's happened?"

"How do you like this?" answered Borovoy in agitation. "This queer creature attacked the dogs, or else they attacked him. We were sitting in the tent and didn't see how the squabble started. Anyway, when we rushed out with our guns he was trampling on two of our dogs. We let him have a couple of explosive bullets in the belly, to stop his little game, and he died of indigestion."

Igolkin pulled away the dogs, which were circling round the dead beast, and the three explorers began to examine it. At their first glimpse of the head, Kashtanov and Papochkin both exclaimed:

"Why, it's a rhinoceros!"

"A rhinoceros here, in the Arctic?" said Borovoy, sceptically. "It's true, it is rather like a rhinoceros; though I've only seen one in pictures. But how can there be a tropical animal here, in the tundra? I can't believe it."

"And will you believe," Kashtanov interrupted him, "that we've just been shooting mammoths—fossilised creatures that have been extinct for thousands of years?"

"For heaven's sake!" cried Borovoy. "Don't make jokes like that. All we've seen these last few days has been so extraordinary, and unnatural that I feel I must either be dreaming or raving mad!"

"Calm down, old fellow!" cried Kashtanov, grasping Borovoy's hand. "We're all equally worried and staggered by what we've seen. All this is strange, and we can't understand it, but nothing is contrary to nature, you know. Remember we're on an Arctic continent cut off from everywhere, deep below the earth's surface—separated from the world by a broad zone of ice. There must be special physical conditions on this continent which enable mammoths still to exist here. Why not rhinoceroses as well?"

"African or Indian rhinoceroses in the Arctic tundra?"

"No, not African ones but Siberian ones, long-haired; that sort used to live in Siberia along with the mammoths."

"Really? I didn't know there were such rhinoceroses. But why do you think this is not an African one?"

"Just look at it. It has long brown hair, whereas the tropical rhinoceros has none; it is bigger than those which we know still exist; and its front horn is huge and flattened at the sides."

Seeing how calmly Kashtanov and Papochkin were taking this miraculous occurrence, Borovoy calmed down too, and asked:

"And where's this mammoth you were chasing?"

"We couldn't drag it here to show you," laughed Papochkin. "We killed it some way off, out in the tundra. There was a little herd of four of them, and in the distance our geologist friend mistook them for basalt hillocks. But then, to our horror, these volcanic mounds started wandering across the tundra! And, by the way, where's our trunk? We only brought back the trunk and tail. Don't let the dogs get at them!"

"Let's go and fetch them."

Photographing, measuring and writing a description of the rhinoceros took them more than three hours, and only when this was done did the scientists think of having a rest. During their meal they recalled that their two companions were still away, and became anxious about their long absence.

"With this sun perpetually at the zenith you lose all sense of time," grumbled Borovoy. "Morning, afternoon, evening, it's all the same. The day seems endless."

"It really *is* endless, if the sun stays in one spot in the sky," Kashtanov observed.

"But the light did grow dimmer during last night," remarked the meteorologist. "You might think that was due to this fog, but I went out about midnight and noticed that the fog was no thicker than during the day, yet the sun was much less bright than before and there seemed to be large dark spots upon it."

"That's most interesting!" exclaimed the Professor. "Why didn't you pass that strange new fact on to us at once?"

"There's no shortage of strange facts here! But I wanted to check it for myself before mentioning it to you. Today, about midday, when I took another look at this crazy sun there were no dark spots on it. So I thought I had just made a mistake last night."

"It's my opinion," said Papochkin, "that there has been some disaster which has affected the sun while we were travelling

through the mist across Nansen Land. That's why we see it at the zenith when we're on the eightieth parallel and why it shines all round the clock."

"Perhaps the earth has turned over gradually so that the area round the North Pole is facing the sun?"

"That's unthinkable," Borovoy broke in. "How could the earth's axis lean over so far in such a short time without grave earthquakes occurring?"

"We might not have noticed those earthquakes while we were travelling through the mist and ice. I can't account for the sun's strange position in any other way," insisted Kashanov.

"But why are you so sure that this sun we are looking at is the same one we last saw above Russian Ridge?" asked Borovoy.

"What other one could it be?" asked Papochkin in amazement.

"Why, you could just as well suppose that the moon had burst into flames again, or that some new luminous body had accidentally flown into our planetary system and attracted our earth as a satellite!" said the meteorologist, smiling enigmatically.

"What's the good of all these unlikely hypotheses?" said Kashanov. "There *are* hypotheses, founded on geological facts, that the earth's axis has actually shifted at certain times. That's how we explain the freezing which has taken place at various geological periods in Franz Josef Land, Greenland, and so forth."

"I don't doubt it; you know best about that, anyhow. But today I measured the angular radius of this luminary of ours, and I found that it is twenty minutes, whereas the angular radius of the sun is nearly sixteen minutes, as you well know."¹

"Now that is important!" exclaimed Kashanov.

"And why this reddish light instead of yellow?"

"Isn't it because of the mist?" suggested Papochkin.

"I thought so myself. But today I managed to get a glimpse of this peculiar sun when the mist cleared for a moment. And its disc was the same reddish colour as our sun when it is sinking

¹ The size of the sun's disc and of those of the moon, planets and stars is determined by the telescope and other optical instruments in minutes of a degree of the firmament; and is called the angular radius.

and shining through the moist lower layers of the atmosphere, or during a dust storm."

"Yes, that's queer too."

"And then those dark spots which make the light grow dimmer at certain times of the day. I'm going to try and check that tonight. If it happens again I shall be finally convinced that it's not the sun we have over our heads but something else."

"Where's *our* sun gone, then?" Papochkin asked anxiously.

"How should I know? That's just one more of the peculiar phenomena we've been witnessing lately."

"Yes, indeed, one of many," said Kashtanov thoughtfully. "A huge depression in the continent; the strange behaviour of the compass-needle; warm weather at the eighty-first parallel—and not unusual weather to judge by the ending of the ice and the green state of the tundra; mammoths and rhinoceroses wandering about over the tundra; a sun unlike its usual self, sticking at the zenith all day and all night. . . ."

"And there's a lot more to come, I feel sure of that. . . . Here are our friends coming back, and I bet you they are bringing us one more strange fact."

They all jumped up and looked towards the horizon, where they saw two men carrying something dark suspended on a long stick. Papochkin put the kettle on the spirit stove and started preparing a shashlik of rhinoceros meat, while the rest hurried off to meet their friends.

"Well, we've certainly had our fill today!" said Maksheyev. "We've seen cows and bulls and we've shot at them, but all we bagged was this calf, which we've been carrying for three hours."

"And we've collected some quite distinctive tundra plants, which I'd have classified as extinct if I hadn't picked them myself," added Gromeko, on whose back hung a botanical portfolio stuffed with specimens.

While they were having a snack and some tea, Maksheyev and Gromeko described what they had seen.

"About six miles from here we found ourselves in tundra like this but drier. Then the vegetation grew richer and there were some shrubs and even some small trees. . . ."

"Arctic birch and Arctic willow they were, but new kinds—and a gaunt-looking larch," added Gromeko. "After that we

came on some flowering plants; some of them I did not know, but others answer the description of certain fossil flora of Canada."

"Eventually we came to a very deep and narrow stream, and we followed its course. The trees grew taller than us and there was a thicket of shrubs between them which it was hard to get through. And then we ran into a herd of oxen down at a drinking place."

"What kind of oxen?" asked Papochkin with interest.

"They were more like wild yaks than oxen," Gromeko corrected his companion. "Black, with long hair and huge thick horns, and a hump on their backs."

"That's what the bulls were like," Maksheyev broke in again; "but there were others, the cows apparently, which were a little smaller and had thinner and shorter horns; and there were a few calves too. I had not expected to meet anything but marsh-fowl and small game in the tundra, so I had only taken my fowling-piece."

"And I hadn't taken a gun at all!"

"So I had to shoot a calf with nothing but a large case-shot which I happened to have. The rest of the herd rushed to cover in the thicket, but the calf fell into the stream: we hauled it out and finished it off with a knife."

"The calf weighs a good hundredweight, and we had to drag it eight miles; so, to lighten our load we disembowelled it, though we knew that wouldn't please Semyon Semyonovich."

"Oh well, he's got plenty to console him!" laughed Kashtanov. "Do you know what sort of shashlik you've just eaten?"

"Some sort of Arctic hare, I suppose? I don't know whether there is such a species."

"Not a hare but a rhinoceros, and an extinct one into the bargain."

"Ugh! You found the carcass of a rhinoceros somewhere in the permafrost of the tundra¹ and decided to sample meat that's been lying there thousands of years?" said Gromeko in

¹ In the North of Siberia there have been found from time to time in the permanently frozen soil whole carcasses of animals which existed many thousands of years ago and have been preserved complete, with hide, flesh and internal organs, thanks to the frost which has protected them from decay. Most commonly mammoths have been found, less frequently rhinoceroses, and other mammals still more rarely. The Academy of Sciences sends out special expeditions to examine and remove such carcasses.

amazement. "I wouldn't have eaten it if I'd known. Now I shall be sick."

"All the same the shashlik tasted very nice, though it was a little bit on the tough side," remarked Maksheyev.

"Not surprising for such ancient meat!"

"And do you realise," Papochkin asked, "what we're going to treat you to for supper? Boiled mammoth's trunk!"

"The devil only knows what's going on here," exclaimed Gromeko angrily. "What do you want to do, poison us or something? Testing how our modern stomachs react to all sorts of geological carrion!"

Maksheyev, who was no longer squeamish since his travels in Alaska and Chukotka, said:

"I've read that elephant's trunk is a dainty dish; mammoth's trunk should be the peak of perfection."

"No, I'm not going to eat it!" stormed Gromeko. "I'd rather roast the calf's liver for myself; at least it's fresh."

The others at last let them into the secret and showed them the rhinoceros carcass and the trunk, tail and hair of the mammoth; the botanist finally calmed down, and even joined in the discussion on how the famous trunk should be cooked, pulling some shoots of wild garlic out of his pocket.

"These will make a fine seasoning for the trunk," he said; "what a pity there aren't more."

Over supper they decided to spend one more day in the same place, so as to go all together to where the dead mammoth lay and bring a stock of meat back to the tent with such parts of the animal as could be preserved.

"Now we can seriously consider our next steps," said Kashanov, after the meal. "Our reconnaissance has given us something to go on. And while we're talking, let's give Papochkin a hand in preparing the rhinoceros's and the calf's skulls for preservation. By the way, Semyon Semyonovich, to what species do you think the calf belongs?"

"If I hadn't seen a mammoth and a Siberian rhinoceros alive, with my own eyes," replied the zoologist, "I would have said that the oxen we met were like the yaks of present-day Tibet. But now I'm inclined to think that they were primitive oxen which became extinct with the mammoth and the rhinoceros."

XIV

TRUHANOV'S LETTER

WHEN discussing what direction they should take next, they all agreed that Nansen Land had given the expedition many new and inexplicable facts, and that more of these lay ahead.

They had learnt from their recent trips that before them, beyond the tundra, there was a forest which they could not possibly think of crossing with sledges and dogs; they would have to leave sledges, dogs, and skis behind, with part of their load, and press forward on foot, carrying the essentials themselves.

They had no idea how far this forest extended and what they might meet on its far side. It seemed most likely that the warmth and the plant and animal life belonged to the bottom of the deep depression only and that on the opposite slope of this depression, the snow and ice would begin again; if so they would need their sledges, skis and dogs.

It was therefore expedient to adopt a different plan—to cross the tundra on their sledges, going round the edge of the ice, so as to examine the entire circumference of the depression, while making a few trips into it lightly equipped. But then they would fail to explore the middle of the depression, where the most interesting flora, fauna and geology would probably be found. Judging by the numerous streams which ran towards the depths of the depression from the edge of the ice, these depths must hold some extensive lakes, or one very large lake.

Both plans had advantages and disadvantages. Which should they adopt? Borovoy, Igolkin and Maksheyev were for the route round the edge of the ice, whereas the naturalists preferred to plunge into the centre of the depression, where they expected to find more to interest them.

They might have split into two groups, one, with the heavy baggage, going round the edge, the other, unburdened, striking straight across the depression, intending to meet the first group on the opposite side. But who could say how far the depression stretched to east and south, and whether it was even possible to get round it? Might not either or both of the groups meet some

insuperable obstacles and get into desperate difficulties? Might not the loss of the whole expedition result from dividing its forces?

It was very difficult to come to a decision, and the choice seemed fraught with grave consequences.

After due consideration Kashtanov said to his comrades, who were still arguing bitterly:

“Don’t forget we have got a sealed packet which the organiser of the expedition gave us in case we should get into difficulties. He authorised us to open it when we were at a loss as to our position, or our next action. Don’t you agree that that moment has come? Just lately we’ve seen so much that’s inexplicable and extraordinary, and now we don’t even know which way to go next.”

The others had forgotten about Truhanov’s packet, and they all agreed with Kashtanov’s proposal. The packet was taken out of the box where it lay along with the most precious instruments and the money. Kashtanov unsealed it and read it aloud:

Dear Friends—The moment when you are reading these lines will perhaps be a very difficult one for you, but I hope that I shall not disappoint your hope of receiving advice and clarification.

I must first admit that I have involved you in such a dangerous and unusual enterprise that if you had known where I was inviting you to go, you would have thought me mad and declined to take part in the expedition. I had already made the experiment: I mentioned my plan to a certain scientist and asked him to organise an expedition at my expense, but he categorically refused and called me an unpractical visionary.

For this reason the only way to obtain an expedition which would check my theoretical suppositions was to keep its ultimate goal and tasks to myself. It would have to be fitted out as though intended to explore an unknown area in the Arctic. My theory might turn out to be wrong after all: the expedition might only find some islands or an ice-bound continent and return home after merely exploring this land. My outlay for the expedition would then not have been wasted since my hypothesis would once for all have been proved erroneous and at the same time the last blank space on the map of the Arctic region would be filled in.

To come to the point: Observations carried out on Mont Blanc

and Munku-Sardyk, data produced by seismological stations and research into the distribution and anomalies of the force of gravity¹ have led me to believe that the kernel of the Earth is not at all as envisaged by geologists and geophysicists. I am convinced that the earth has an extensive internal cavity, most probably with a small central luminary which may or may not have become extinguished. This cavity may be connected with the earth's surface by one or two orifices, enabling us to penetrate inside this hollow globe.

My theory could be confirmed or refuted only by a special expedition, sent to look for one of these orifices, seeking these in the unexplored parts of the two Polar regions. I chose the Arctic as being the more accessible for a Russian expedition.

If you have managed to find the orifice, try to get down into it. Perhaps you have already descended into it without realising, under the impression that you are going into a deep depression. If so, and if you still have the strength and resources to advance, try to penetrate deeper and investigate this internal cavity of the earth, but do not take any unnecessary risks.

If for any reason this task seems beyond your power, turn back; the discovery of the entrance to the earth's internal cavity is in itself a tremendous achievement, and investigation of the actual cavity can be entrusted to a new expedition, equipped on the basis of your experience. As true scientists you will, I am sure, press onward when you find yourselves on the threshold of great discoveries. But I beg you to consider the position thoroughly, and do what is wisest so as not to risk losing all that you have already won.

Perhaps you will divide into two groups, one going ahead into the depths of the cavity while the other remains at the entrance so as to be able to go to the rescue of the first, or to announce the wonderful discovery to the scientific world.

I am deeply disappointed that I am unable to share your labours and your discoveries, and that I must confine myself to this letter. If it has not made things clear to you, take no notice of it. In any case I wish you all possible success from the bottom of my heart.

I. I. Truhanov.

Pole Star

14 June 1914.

¹ Anomalies of the force of gravity—errors in determining the dimensions of the force of gravity on the earth's surface, both positive and negative, caused by the structure of the earth's crust.

XV

LAND OF ETERNAL LIGHT

THE members of the expedition listened to its organiser's letter with interest and amazement. When Kashtanov had finished, silence reigned for a considerable time while they thought over what they had heard and tried to apply it to the strange phenomena of the last few days.

"At last I feel clear in the head," said Borovoy with a sigh of relief. "Now I understand this sun constantly at the zenith, and the heat, and the mammoth and the rhinoceros, and the eternal mists, and the compass's tricks. The barometer's antics are the one thing I can't explain yet."

"Yes, nearly everything's plain now," Kashtanov agreed. "I think our descent into the orifice began at the pass over Russian Ridge. The wall of ice was evidently the extreme edge of the outer surface, and when we had passed it we were inside the internal cavity and going south instead of north; the compass showed this correctly though the direction of our march had not altered. Then we began climbing, and crossed over a flat ridge of ice; when we came down from that, we found ourselves in the tundra at the extremity of the ice formed by the winter snows that drift into the depths of the cavity. The mammoth, the rhinoceros, and the primitive ox have survived here thanks to the equable temperature and the absence of their enemy, Man. . . ."

"Yes, that's true—we've only just got into this cavity and we've already destroyed three of its inhabitants," observed Gromeko.

"The sun which is always at the zenith is evidently the true little kernel of our globe, still in the incandescent state; it lights and heats the inner surface of that thick, hard crust of which we only knew the outside. Now, thanks to Truhanov's expedition, we can get to know something of this inner surface, which is sure to be extraordinarily interesting and unexpected. Why, in our very first steps here we came across flora and fauna which disappeared from the outside long ago."

"We ought to give this newly discovered land a name instead

of saying 'the inner surface'. After all, it isn't Nansen Land now!" said Maksheyev.

"No, it's too extensive, and it's cut off from Nansen Land by that zone of ice. What shall we call it?" asked Gromeko.

"Day reigns eternally in this land. The central luminary in the heart of our planet seems to fit in with the ideas of the peoples of ancient times who believed a god of fire lurked under the earth. I suggest we name the luminary Pluto and the land Plutonia," said Kashtanov.

Other names were suggested, but after a brief discussion all agreed that Plutonia was the most suitable.

"Now for the important question—shall we be content with discovering the orifice, or shall we push on down into the depths and see something of Plutonia? Shall we go back to the *Pole Star* to tell Truhanov about this striking confirmation of his theories? Or shall we try to go on?"

"Of course, let's go on! On, as long as we have the strength and the means! We've plenty of time yet," they all cried.

"I think so too," Kashtanov went on. "But how shall we organise the further exploration of Plutonia?"

"I expect," said Borovoy, "that the temperature will be higher than here when we get further into the interior, away from the snow and ice which result from the penetration of cold from the outer surface. Sledges, skis and dogs will only be a burden to us there, and we ought to leave them here."

"We can't leave the dogs on their own. So we must follow Truhanov's advice and leave part of the expedition with them—at least two men, for who'd want to stay here alone for long? These two, together with the dogs, sledges, skis and other excess baggage, will stay to carry out observations in the tundra and at the edge of the ice. And if the others don't come back within a certain time, they'll go by sledge to report to the *Pole Star* on our discoveries and to lead a fresh expedition to look for the lost group and carry out further exploration of Plutonia."

"But supposing the others return a little later than the agreed time. How will they get back through the ice?" asked Maksheyev.

"Two sledges, with skis and provisions must be left here, in case of that happening. The late-comers will have to travel without dogs, dragging the sledges themselves, but that won't be too hard; their load need not be heavy as we've left dumps of provisions all along the route."

They all agreed that this plan was most suitable, but nobody wanted to stay in the tundra, on the threshold of the mysterious country. They had to decide which of them had the greatest interest in making the journey into the interior; and these were agreed to be the zoologist, the botanist and the geologist, for whom there was little to do in the tundra. Kashtanov, Papochkin and Gromeko then, would have to go. Igolkin, the only non-scientist member of the expedition, whose main job was looking after the dogs, should naturally remain in the tundra. The choice lay between Borovoy and Maksheyev. As each was magnanimously ready to give way to the other, they decided to draw lots, and Borovoy drew the slip with the word "stay".

It took a fair time to solve the various problems of sending off the expedition into Plutonia. They had to choose a method of travel and to decide what must be carried. They would each have to carry a sizeable load even if they left all the tinned food behind (counting on shooting enough to eat); and they could not expect that they would have smooth going.

"Suppose we take some of the dogs and make them carry our loads?—though they aren't used to such work, poor things, and they won't like it in the warm climate," suggested Gromeko.

"That would hardly work," remarked Maksheyev. "We should risk losing the dogs, and we must have them for our return journey across the ice. I'd rather make use of a stronger, more docile means of transport—one which will carry both our baggage and ourselves."

"What do you mean?"

"I mean water. The stream which we struck today and could not cross, runs south, in the direction we have to go. We have in our baggage two small collapsible boats for crossing polynias when going through the icefields. We had quite forgotten about them because we have not needed them so far. Each of them can carry two men, so let's get in and start floating. And when we come to the forest we'll make a raft, in case the boats get overloaded, and then we'll drift wherever the river takes us."

"An excellent plan!" exclaimed Kashtanov.

"Easy and comfortable! We'll just drift along looking around and taking notes," added Papochkin, delighted.

"Except that we may not be able to see further than the river banks, which are probably covered with thick vegetation,

so that we shall be drifting along a green corridor, seeing nothing!" said Gromeko.

"And what's to stop us drawing alongside the bank and making a trip into the hinterland whenever it seems interesting or expedient? We'll spend the nights on the bank, too," Maksheyev explained.

"And we'll set out on our trips with the minimum of equipment, without anything on our backs; we'll have more scope that way," said Papochkin.

"The boat and the raft will make it possible for us to collect more specimens. If we had to carry all we collected on our backs we wouldn't feel like adding more every day," observed Kashanov.

"And the last point is, that in the boat we shall be safer from wild beasts and reptiles living in the forests and swamps. This strange land may have further surprises for us as we go deeper into it," said Gromeko.

"You've made an excellent proposal, Yakov Grigoryevich, and deserve everyone's thanks," concluded Kashtanov. "So I suggest that we call the river after you. And now I think we should get into our sleeping bags, or anyway on to them as it's so warm; and to-morrow we'll visit the mammoth and bring back its hide and tusks and a stock of meat on sledges."

"Shouldn't we shift the whole camp to where the mammoth is, instead?" urged Papochkin.

"That would not be practicable. The stream which we're going to float down runs in the opposite direction, and there's no sense in moving further away from it. Besides, the hillock where we are has a lot of advantages: it's dry, you can see it a long way off, it's a good distance from the forest with possible wild beasts, it's near the ice, and it's well ventilated by the wind—very important for the dogs when the weather gets even warmer. There's a good view from it, so that it's easy to see any enemies coming a long way off."

"And it's convenient for making meteorological and other observations," added Borovoy. "We'll set up a proper station here, and I hope my barometers will decide to show changes in pressure."

XVI

SELF-APPOINTED GRAVEDIGGERS

IT was ten o'clock in the evening by their watches when at last they broke off their conversation, and all lay down on their sleeping bags and went to sleep.

Next morning over breakfast they discussed whether it was worth while going over to the mammoth or whether they should not instead make preparations for the departure of the expedition.

"If we were sure of meeting more mammoths it would not be worth going to this one, since we've already photographed it and described it. But, as we shall soon be in wooded country we may not see another, as they may only live in the tundra, near the ice," said Kashtanov.

So they decided to go to where the mammoth lay, and four of them set out, with three sledges and the necessary dogs.

Gromeko and Kashtanov stayed behind: the former wanted to collect some more specimens of the spring vegetation growing around the hillock before he left, while the latter wanted to dig the side of the hillock to discover what it was made of. This isolated mound in the middle of the tundra struck him as odd.

The party set out under the leadership of Papochkin, who knew where the quarry lay and the route that led there. On the way they shot a number of marsh fowl which were flitting about the tundra near the stream, and also an unusual kind of hare, resembling a very large jerboa,¹ which gave great satisfaction to the zoologist.

The mammoth's carcass came into view far ahead of them, looking like a small hill rising from the level tundra. As they drew near it, Igolkin, who had keener sight than the rest, warned his companions that there were some grey animals bustling about round the carcass.

Leaving their sledges some way off, the hunters cautiously

¹ Jerboa—a small mammal of the rodent family with a very short neck, the head of a hare, large ears, long whiskers and a very long tail, very short forelegs and long hind legs. Lives in burrows in sandy soil and eats bulbs and roots.

approached the carcass; they suddenly pulled up short in amazement: the busy creatures had vanished into thin air.

"Hey, look at this!" exclaimed Papochkin when they had at last reached the mammoth.

"Somebody's been very busy here since yesterday."

It was as though huge moles had been at work around the carcass. Heaps of earth with roots of shrubs a yard long had been piled up round it and the rear half lay in a pit, hardly protruding above the surface.

"Who could have done this?" the hunters wondered. "Some experienced gravediggers, anyway. I think they were trying to bury the whole carcass, perhaps to hide it from the wolves or as a store of food," said Maksheyev.

Igolkin was restraining one of the dogs which, after sniffing the broken earth, had suddenly hurled itself under the belly of the mammoth and dragged out a queer little creature which was fighting desperately with its short paws and grunting like a pig. They despatched it with a knife, took it away from the dog, and began examining it. It resembled a badger both in shape and colour.

Further investigation produced several more of these animals lurking under the carcass, which they had intended to bury and gradually devour. As these self-appointed gravediggers had made it impossible to remove the hide from the whole carcass, the explorers were able only to strip the left half. Then they examined the mammoth's inside, cut off its legs, hacked off one of the tusks, and extracted an eye, half the brain, the tongue, and two teeth. The dogs joyfully stuffed themselves with the remains there and then. Some large pieces of meat from the thigh and sirloin were also placed on the sledges, and then the party wended its way slowly back. The gravedigger, the hare and the birds made up a zoological bag which gave Papochkin complete satisfaction.

"Let the gravediggers bury what's left," joked Borovoy. "When we're short of meat for the dogs we'll go back with Igolkin to lay in a fresh stock. Perhaps we'll go back even sooner, before the meat goes bad."

"Then you can fetch the skull," said Papochkin. "The gravediggers will leave that quite clean, I expect."

As they approached the tent the hunters saw that Kashtanov and Gromeko were engaged on a strange job. They were hauling

lumps of white stone out of a pit dug in the side of the hillock, and stacking them up.

"This hillock turned out a real boon," Kashtanov said to his comrades as they came up. "To find out its composition I dug a pit about five feet deep and at that depth I came upon ice, compact and pure. I found the same thing in another spot. Then I had the idea of digging a chamber in the ice in the heart of the hillock; it will make a good ice-box to preserve our food as well as the hide and so forth. After all, mammoths and rhinoceroses won't turn up for supper every day!"

"Is the hillock ice all through, with earth only on the surface?" asked Borovoy.

"That's what *I* think. Fossil iceblocks of that sort have been found in the North of Siberia. That's what this is—or else a large winter snowdrift, or a bit left behind by a mass of ice which has retreated. It has gradually become covered by silt and sand from the brooks that flow from the glacier, and so has been preserved."¹

This discovery of Kashtanov's was extremely valuable for the group remaining behind who now had a splendid larder right underneath where they were living.

"Later on we'll make a proper door and a large chamber right inside," said Borovoy.

"And let's dig another cave on the other side of the hillock as well, where we can keep the dogs when it gets very hot," said Igolkin.

When they had unloaded the sledges they all set to work helping Kashtanov and Gromeko dig out a cavity large enough to hold all the remains of the mammoth and the rhinoceros. When it was finished and filled, the entrance was blocked with lumps of ice, and skis and sledges were piled against it, so that the dogs should not be able to get at the food.

Next morning they busied themselves with preparations for their departure. They sorted out their luggage again. The tins of food, the spirit, the dried fish, they put away in the icebox, while they loaded the sledges with the boats and equipment needed for their journey into the heart of Plutonia. They took

¹ The hillock had evidently been formed by fossilised ice, preserved thanks to the existence of permafrost at no great depth. Such fossilised ice is met with quite often in the North of Siberia, especially near the shores of the Arctic Ocean.



The expedition had broken up, and four of the explorers were drifting away into the heart of a strange land.

their last meal together and moved off towards Maksheyev River after saying goodbye to Borovoy, who remained behind to guard the tent and stores. Igolkin was to return with the sledge that evening. They had decided to take one dog with them on their voyage, as a watchdog, and their choice fell on General. They clipped his coat so that he should suffer less from the heat, and the short-haired dog looked so funny that nobody could help laughing at him. He had been left with a forelock on his head, a fringe round the upper part of his legs, and a brush on his tail. Maksheyev, who had done the clipping, explained that he had left these strange decorations to frighten away any hostile animals they might encounter.

When they reached the stream, which was about six yards wide and from three to six feet deep, they launched the boats and got into them, two by two. In each boat one took the tiller and the other the oars. General sat in the bows of the leading boat, which was occupied by Maksheyev and Gromeko. The dog's grotesque head—its big ears sticking out, with the forelock between them—protruded above the side of the boat.

Igolkin remained on the bank until both boats, which were swiftly carried down by the current, had disappeared in the distance.

Borovoy hoisted a white flag over the tent, which was barely visible on the skyline. The expedition, which up to now had shared all labour and hardship in common, had broken up, and four of the explorers were drifting away into the heart of a strange land. Would they come back, and if so when? How many of them? and in what state?

XVII

DOWN THE MAKSHEYEV RIVER

THE two boats glided swiftly down the dark stream as it hastened south, gently splashing, between low banks overhung with shrubs of Arctic willow covered with fresh leaves.

Beyond both banks stretched the tundra with its vegetation of stunted bushes, and, as before, the wind blew in the direction they were going. The explorers now understood that this was a north wind, pressing in across the ice from the cold orifice of the cavity, drawn from the outer surface of the planet into its warm interior. The mists gathered as before, now hiding and now revealing the reddish luminary that stood motionless at the zenith. The temperature went up to 54 and occasionally a fine rain fell from the mists, but never for very long.

The boats drifted at about five miles an hour. The men at the tiller kept a survey record, noting the direction of each of the bends in the river. After drifting about fifteen miles they hove-to for the night.

A short trip along the bank showed them that the shrubs in the tundra were now taller and with the dwarf larches, willows and birches, formed thickets which, though small, were very dense. Among the shrubs narrow tracks had been trodden, leading to the river-bank and evidently serving animals as paths to their drinking places.

For the first time they spent a night in their light tent without sleeping-bags.

As Maksheyev was getting ready to turn in he remarked: "This eternal light completely disrupts all our habits and ideas. We talk about morning, noon and night and we look at our watches, but the sun keeps at the zenith and burns away cheerfully, as if it were mocking our words."

The night, or time of rest, passed undisturbed.

Next day they drifted about thirty miles and then stopped earlier than before so as to make a longer trip inland. The river's banks were now covered with still taller shrubs and occasionally trees, forming green walls which completely blocked the explorers' range of vision.

After their meal Gromeko stayed near the tent to collect plants, while Maksheyev, accompanied by General, set off westward and Kashtanov and Papochkin went east, following the animals' tracks which ran through the thickets of shrubs taller than themselves. In places they saw the spoors of various animals, among which the zoologist recognised those of the mammoth, the rhinoceros, some large and small cloven-hoofed creatures and one whole-hoofed species.

Sometimes they came upon imprints of the soft paws of

different sized beasts of prey. Cold shivers ran down the explorers' backs at the sight of these spoors, for they were nearly eight inches long, and the claws of the toes had sunk an inch and a half into the ground. The zoologist deduced from the shape that the spoors belonged to a bear of enormous size.

"It's probably a cave bear, contemporary with the mammoth," said Kashtanov. "It's the biggest of all the known members of that family."

"And doesn't it hunt cave-men?" asked Papochkin.

"We've sometimes found bones, claws and teeth belonging to this bear, carved by cave-men," answered the geologist. "But I don't know that anyone's found bones or skulls of cavemen carved by bears!"

"Anyway, it would be as well not to meet him."

"Not to meet such an interesting beast as this? Our ancestors conquered him, armed with nothing but clubs and stone axes; it would be a disgrace for us to be afraid of him with our up-to-date guns and explosive bullets!"

Leaving the bank of the river the explorers came out upon a broad meadow, a clearing overgrown with thick, short grass, and gay with flowers of various kinds.

From the edge of the wood, the explorers saw that mammals of different kinds were grazing in the meadow, separately and in herds, among them being some species which they recognised at once as extinct on the earth's surface. There were black primitive cattle with huge horns and humps, gigantic reindeer with equally gigantic antlers, small, shaggy, wild horses with scanty tails and short manes. A couple of rhinoceroses had their heads buried in the bushes, and several mammoths were standing together in a small group, rhythmically wagging their heads and trunks, probably to drive away the importunate insects—gnats, horse-flies and midges—which abounded.

After gazing at this peaceful scene of "living fossils" at pasture, Kashtanov and Papochkin decided to get nearer and photograph some of the animals.

They crept on all fours along the edge of the wood, first up to a group of oxen, and then to a couple of rhinoceroses, which they snapped at play, clumsily jumping one over the other. The rhinoceroses crossed their horns as though these were giants' sabres, treading down the grass and ploughing up the ground with their enormous pedestal feet.

Next came the turn of the mammoths, which were standing nearer the middle of the pasture. But before the hunters could creep near enough there was a flurry at the far end of the meadow, where the reindeer were grazing; these creatures suddenly raised their heads, listened intently and all at once began running away, evidently terrified by some unseen but frightful enemy. The reindeer fled past the mammoths, which in their turn took fright and began to move away at a heavy trot, trunks in air. Both reindeer and mammoths were running straight towards the hidden hunters.

"When the reindeer are about a hundred paces from us, fire at the front one," muttered Kashtanov. "I'll photograph them when they stop for a moment, then I'll fire too, otherwise they'll trample over us."

Papochkin got his gun ready and when the first reindeer, a huge beast with its head held high and its nostrils flared in alarm, was near enough, he blazed away. Struck full in the chest, the reindeer fell heavily on to its knees, while the rest, hustling each other, stopped still in a cluster, their necks outstretched.

Kashtanov managed to take a picture of the interesting group, then handed over his camera to the zoologist and himself fired at one of the reindeer, standing with its left flank towards him. The animal gave a leap and crashed to the ground, while the remainder of the herd turned to the right and fled along the edge of the wood.

The mammoths which had been following the reindeer now approached and came to a halt in front of the hunters' two victims. Papochkin seized the opportunity to reload their guns, while Kashtanov photographed the mammoths.

"Shall I fire?" asked the zoologist in a voice quivering with excitement.

"Why should you? We have an adequate stock of meat now, and we've already studied a mammoth in the tundra. We'll only shoot if they attack us."

Meanwhile the animals under discussion were standing still, brandishing their trunks, as though consulting each other. There were six of them, including two young ones with smaller tusks and shorter hair than the rest. These soon calmed down and began playing together and gambolling around the adult mammoths, which from time to time gave a warning bellow. At

last the old male turned to the right, and the whole herd followed him along the edge of the meadow, where only the two rhinoceroses now remained.

"What was it that frightened those peaceful creatures?" asked Kashtanov. "A cave-bear, perhaps?"

"Or some still more frightful fossil creature from your paleontological menagerie!"

"Who knows? But I think we'd better not go to that end of the field; the beast might jump out on us from the thicket so suddenly that we shouldn't have a chance to fire."

"Well, then, let's get busy on the reindeer; we must measure them, skin them, and drag them to the boat."

The reindeer belonged to a very large-sized species, contemporary with the mammoth, the primeval ox and the cave bear, and now extinct on earth.

After skinning both animals, the hunters cut off the hind legs of the smaller of the two and trailed back, heavily loaded, to the river, intending to return to collect some of the meat—if their companions proved less fortunate and if the unknown beast of prey which was probably prowling nearby had left any of it by then.

XVIII

A HUNTER HUNTED

AT the camp-site they met Gromeko, who had been impatiently awaiting their arrival. He had gone all round the edge of the camp collecting plants, and had plucked a goose they had shot that morning and started cooking it for supper. Suddenly General had run up, all by himself. There was a note from Maksheyev tied with string round his neck. It read:

"I have shot a large animal which is too heavy for me to carry back to the tent. Would Semyon Semyonovich please come and examine the creature on the spot. General knows the way, but, just in case, I attach a sketch showing it."

On the back was a pencil drawing of the way that Maksheyev had followed, with the direction and the distance in paces shown.

After a short rest, Papochkin set out with Gromeko to look for Maksheyev. General guided them well, but hesitated at forks in the path; and then the sketch helped, as all such forks were indicated on it. After walking quickly for half an hour the hunters were not far from their comrades' halting-place when two shots rang out from that quarter. General rushed ahead with a loud bark and the hunters hastened after him, fearing that Maksheyev was in trouble.

Soon they reached a large clearing with a copse of trees and shrubs in the middle. Beside this copse they saw a yellowish mass above which Maksheyev's head appeared; in front of him about a dozen reddish-brown creatures, obviously wolves, were running about the clearing.

General pulled up short at the edge of the clearing, uncertain whether to attack when the balance of forces was so obviously uneven.

As soon as they became aware of the hunters' appearance, the wolves began running away, but Maksheyev shouted:

"Give them a couple of charges of small shot, if you've got the double-barrelled gun; it's a pity to waste my explosive bullets."

Gromeko quickly loaded his double-barrelled gun with small shot and fired left and right into the pack. The wolves fled into the bushes, followed by General, who on the way despatched one which had fallen to Gromeko's fire. The hunters went up to Maksheyev and heard his story:

"When I arrived at this clearing I stopped at the edge, as the dog began to growl and get restive. I noticed that there were some reindeer grazing behind this little grove here and decided to stalk them, as we hadn't met such animals before. I began creeping through the bushes round the edge of the clearing, then suddenly, as I drew level with the grove, I noticed a large yellow animal which was also after the reindeer, stealing up on them from inside the grove. I thought that this quarry was even more interesting than the reindeer, and began following it, hidden in the bushes not more than a hundred paces away. The yellow animal, taken up with stalking the reindeer, either didn't see me or didn't deign to notice me. When he had crawled

up to the copse, he rose to his full height and gazed greedily through the bushes at the reindeer which were grazing, peaceful and unsuspecting. I saw then that there were dark stripes along the beast's light-coloured flanks and realised that it was a large tiger.

"He was standing with his left side towards me in a superb position, and I lost no time in putting an explosive bullet into him.

"The reindeer were frightened by the sound of the shot and darted off past the grove. When they caught sight of the tiger, which was still thrashing about, they turned away sharply and came straight at me. I hardly had time to jump aside. They were magnificent animals—one old male with tremendous antlers, and a few does and hinds.

"At first I was going to skin the tiger myself but when I examined it I realised that it too belonged to some breed extinct on earth. So I decided it would be better to send for the zoologist. I'd have gone myself but I was afraid that some beast of prey would spot the carcass and damage the skin. That's why I thought of sending General, who has carried out his mission splendidly. And it's just as well I didn't leave the clearing, for soon afterwards I heard the howling of wolves—first one, then another, until there were nearly a dozen in the clearing. At first when they saw me beside the dead beast they were afraid to come nearer, but later they got so cheeky that I had to waste a couple of rounds on them."

The animal which Maksheyev had shot had whitish-yellow fur with dark-brown stripes along the back and several stripes of the same colour on its sides, which made it resemble a tiger; but the shape of its head and body, the short tail and the formation of the paws, caused the zoologist to exclaim:

"This isn't a tiger, it's some sort of bear!"

Maksheyev was a little disappointed but after examining the beast more closely he had to agree that the brown stripes were all it had in common with the most ferocious member of the cat family—every other feature pointed to its being a bear.

"It's probably a cave bear, contemporary with the mammoth; up to now it's only been known by parts of its skeleton," Papochkin explained. "It's a great deal more interesting than a mere tiger."

After measuring the beast they skinned it, and took the skin, the skull and one hind leg back with them.

That evening's supper was excellent: goose soup with wild onions, shashlik of reindeer meat, and slices of bear—though the harsh flavour of the latter was not to everyone's taste.

The mist was less dense that day; Pluto shone through a fine film of steam and was only rarely clouded over. The temperature stayed at 55 and the wind dropped a little.

"I think," remarked Gromeko, "that the mist will have gone in a day or two and we shall see the colour of the Plutonian sky at last."

Their rest was broken only by the distant howling of wolves, which were probably gorging themselves in the clearing on the carcasses of the reindeer, the bear and their own kinsfolk. Even General paid no attention to these noises as he lay beside the tent, protected from insects by the smoke of the camp-fire.

Then they continued their voyage down the river, which grew wider and deeper; there was no longer any risk of the heavily-laden boats bumping their bows against the bank when the river made a sudden turn.

The banks were covered with a solid wall of bushes twelve feet high in places; several kinds of willow and osier, bird-cherry, hawthorn and briar were closely intermingled, and occasionally white birches and larches reared their heads above them. The thermometer showed 57; the mist only rarely covered the sky, and most of the time floated at a considerable height in large flimsy clouds, through which the red sun shone vigorously.

"The mist will probably soon go altogether," said Maksheyev, who had made himself responsible for meteorological observations. "But will these green walls come to an end? While we're between them we can't see anything."

"If we dragged ourselves, heavily laden, through this forest we shouldn't see much more than now, and we would go far slower," remarked Gromeko, who as a botanist was more interested than the others in the green walls.

When they stopped for lunch at a small flat space on the bank, Kashtanov and Gromeko set off on a short trip into the forest, while Papochkin applied himself to fishing and Maksheyev climbed a tree rather higher than the rest. When he came down he said to the zoologist:

"The terrain will soon be different. On the horizon there are

some hills and bare plateaux and our stream is flowing straight towards them."

"And what's just ahead of us?"

"Just ahead of us there's only dense forest on all sides, a sea of green with no clearings."

"If it's so thick all around our friends will soon be back."

It was an hour later when they returned, with little to show for their expedition. They had followed a path between green walls, collecting plants, seen some small birds, and heard a variety of rustling sounds in the forest, but had come upon no clearings. The zoologist, who had stayed by the river, was more fortunate; he had hooked several large fish like Siberian gwyniad, and a huge green frog, a foot long.

After resting they drifted further down the river. Within a couple of hours a fairly high knoll appeared on the right bank of the river, then another, then a third; but these were still covered with dense forest, consisting of limes, maples, elms, beeches, ashes, oaks; while the valleys between the hills were dark with firs and spruces. The boughs of the trees were entwined with ivy, hops, wild vines and bindweed, which overhung the water in places. Birds chirruped and sang in the heart of the forest; from time to time the explorers observed squirrels and chipmunks¹ leaping from branch to branch.

"During our evening trip we shall see something fresh, I'm sure," observed Gromeko. "The vegetation has changed—evidence that the climate here is warmer."

"No doubt of that!" said the zoologist. "Yesterday I still felt I was in the North of Siberia, but today the landscape reminds me of my own part of the world, the South of Russia."

"Shall we come across real tigers today?" asked Maksheyev.

"Perhaps it would be wiser not to split into groups but to go all together, in case of trouble," suggested Kashtanov.

The knolls gradually became higher, and could even be described as hills; their northern slopes were covered with dense deciduous forest, while on the south side there were clearings with isolated trees and shrubs. Here and there rocks could be seen to the great interest of the geologist.

¹ Chipmunk—an animal of the rodent family, similar to the squirrel but distinguished from the latter by its smaller size and lighter yellow fur with lengthwise black stripes along the sides, and also its less bushy tail. It lives in the Siberian forests, in burrows under the roots of trees, for which reason it is also called the ground squirrel.

"Well, there's something for geology today!" exclaimed Maksheyev.

"About time too; my hammer's bored stiff doing nothing. The only bump we met in the tundra was a big disappointment for it," laughed Kashtanov.

"Let's stop now for the night," urged Gromeko. "We've floated over sixty miles today."

XIX

ADVENTURES ON A KNOLL

FOR their camp-site they chose a place near the foot of a high knoll separated from the right bank of the river by a narrow strip of tall-treed woodland. When they had fortified themselves with tea and a snack, all four set off to the top of the knoll. They left General tethered to a tree beside the tent.

A track ran through the forest, the undergrowth beside it being so dense that it would have been impossible to get even a yard into it without an axe; bushes and creepers formed a dense green mass that fringed the track on either side. Only rare beams of reddish light penetrated the green vault overhead.

The hunters advanced silently, in single file, their guns at the ready, looking now ahead, now up at the trees, where an interesting quarry or a dangerous foe might suddenly appear. But there was nothing to be seen but small birds and squirrels.

They reached the side of the knoll without hindrance and began climbing it. The grass was only up to their knees, and Gromeko lingered behind the rest collecting plants.

While the zoologist was examining and writing a description of a large snake which he had killed, Kashtanov with some difficulty hacked out a specimen of the rock. It was unusual, very hard and yellowish-green, sprinkled with silvery metal; after examining it through his magnifying glass the geologist exclaimed:

"Do you know what these rocks are made of? They are of

the same composition as aerolites¹ of the mesosideritic series, semi-ferrous, with olivine base and containing nickel-iron."

"What does that mean?" asked Maksheyev.

"It proves that the geologists' hypotheses as to the composition of the deepest parts of the earth's crust are correct. We are evidently at the edge of the so-called olivine zone,² of heavy rocks, rich in iron; these rocks are identical with the stone meteorites which are fragments of small planets and fall on the earth out of space. We shall probably meet a lot more completely metallic rocks as we go on."

Gromeko joined them loaded with plants of various kinds, and they pushed on up the slope, stepping carefully across the grass, which might conceal poisonous reptiles. Sometimes they actually heard rustlings beside the path, as these creatures hurried away from the explorers, who themselves had no desire to pursue the fugitives.

A rocky ridge crowned the summit of the knoll, and here many large lizards were sunning themselves on the stones—they were yellowish-green, with dark spots, and looked so much like lumps of stone that Kashtanov picked one up, and had his finger painfully bitten. After this he tested all similar lumps with his hammer to avoid making the same mistake again.

The northern slope of the knoll, exposed to damp winds, was covered with dense forest, hard to penetrate without an axe. The southern side, which the hunters were examining, consisted of meadow land with isolated trees. From the top of the knoll it was possible to survey the surrounding area for some considerable distance. To the south, east and west similar and higher knolls extended as far as the horizon; to the north such knolls were lower and fewer, and further off a plain could be seen; across this lay a dense belt of forest, occasionally broken by silvery ribbons of rivers.

The hunters were sitting on the top of the hillock gazing into the far distance when a herd of wild pigs emerged from the

¹ Aerolites or meteorites—masses of iron or stone which fall from space on to the earth in the form of pieces of varying size, molten on the surface through having become incandescent in their rapid flight through the atmosphere. They consist of iron with an admixture of nickel and other, lighter minerals.

² The olivine zone, which geophysical scientists presume to exist, lies at a considerable depth under a thick layer of lighter rocks of the earth's crust; it consists of heavier minerals, mainly olivine, and separates the light surface strata from the metallic kernel of the earth.

forest, which ended on the northern side a few yards below the crest. The leading boar, with long bristles on its back and huge white tusks, halted and lifted its head with spitefully glittering little eyes; it kept stretching out its snout to sniff the air. Pigs and piglets of various ages crowded behind this boar. They only differed from the wild pigs known to the zoologist by their large size.

"Well, here's our supper coming to us of its own accord!" said Maksheyev. "Wild sucking-pig on a spit should be very tasty."

"We don't need meat just now," replied Gromeko who was responsible for the food. "We've still got the reindeer."

"But that shouldn't stop us from laying in a stock; we shan't always have such good hunting."

"But you know, shooting wild pig is pretty risky," Papochkin warned them. "An angry boar is a terrible opponent."

"Let's climb higher up the rocks, where they can't get at us, and shoot a couple of piglets from there," suggested Kashtanov.

They clambered up to the very crest of the ridge, where Maksheyev loaded his gun and fired. The herd scattered wildly in all directions, except for three piglets that got stuck in the grass; but then the leading boar and the pigs returned and hurled themselves at the rock; they circled around it, making vain attempts to jump on to the smooth ledges, and became even more furious at their failure. Thanks to this siege the hunters were able to study the pigs at close quarters. When the zoologist's curiosity was satisfied they had to decide what to do next.

"We can't just stay here," said Kashtanov. "Why, they may keep us stuck for days! They've got food under their very noses, but we've nothing to eat. We'll have to drive them away with shots."

At that moment Maksheyev, who had been watching the edge of the wood for some time, exclaimed:

"There's a large animal stalking either us or the pigs along the edge of the wood: I can just see his yellow back."

"Where? Where?"

"A moment ago his back showed in front of that shrub at the edge of the clearing—watch for him now to the right of it."

They all stared towards the shrub and, sure enough, to the right of it they perceived a brownish shape, with dark stripes, moving slowly about.

"Another bear?" asked Maksheyev.

"This time perhaps it really is a tiger," said Papochkin. "It slinks along like a cat."

"I think it's time to shoot," said Kashtanov.

"Which shall we shoot at—the beast of prey or the boars?"

"Best to shoot at the boars. If they run into the wood they'll bump into the beast of prey and he'll chase them. If they run the other way he'll change his position and we'll be able to see him better or shoot him when we get a chance. But just now we can only see his back and it would be silly to shoot."

"Let's fire one shot at the boars first, while the three other guns watch for the other creature."

The zoologist, who was sitting on a projecting piece of rock, aimed at the leading boar as it was jumping up on to a ledge, trying to attack Maksheyev's boots with its tusks. The shot at such close quarters bowled the boar over at once, and the rest took fright and rushed headlong towards the wood. When they were almost there, the brownish-yellow beast of prey bounded swiftly forward to the left of them; it took a leap of several yards' length, and landed upon the pigs. Two of them fell beneath their enemy's paws and the rest scurried away squealing to refuge in the wood.

"That's no bear, it's a tiger!" shouted Papochkin, who had taken a good look at the animal as it leapt.

"It certainly is," Kashtanov agreed. "One of the sabre-toothed variety, apparently, judging by the huge tusks of its upper jaw. This species was very widespread in the tertiary period, but eventually it seems to have disappeared."

"The creature's leaving us, unfortunately. Look, it's dragging its quarry into the woods; it must sense that we are not trustworthy neighbours," cried Maksheyev.

"Never mind—we've got enough material for to-day," said Papochkin, who was busy measuring the dead boar. "Shall we drag this brute to the boat, or be content with the piglets?"

"If he's fat we could take some of the lard," remarked Gromeko. "Then we'll be able to fry meat in the pan. Well, while you are finishing with him I'll gather a few more plants."

Kashtanov resumed his study of the rocks, Maksheyev and the zoologist busied themselves with the boar and the piglets, and Gromeko crossed to the southern slope of the hillock



Suddenly it dived, seized the stooping botanist by the shoulders,
and lifted him up.

and slowly moved down it gathering plants, many of them new to him. Suddenly a huge shadow passed swiftly across the knoll, like a cloud across the sun; the zoologist and his assistant started and looked up. They saw a bird of enormous size, rather like an eagle, circling over the clearing.

Suddenly it dived, seized the stooping botanist by the shoulders, and lifted him up. But the load proved too heavy for the bird, powerful though it was. Violently flapping its wings, it flew up about four yards but was unable to get any higher, yet unwilling to drop the prey dangling helpless in its talons.

Papochkin and Maksheyev grabbed their guns, but the former lowered his again at once, saying:

"I've got buckshot in mine and might wound Gromeko."

Maksheyev, whose gun was loaded with a bullet originally intended for the tiger, took aim and fired as the bird drew level with him. It fell, letting go of the botanist, and finally collapsed on the nearby rocks.

The hunters hurried to where Gromeko lay senseless on the hillside, face upward. His thick knitted jacket had been torn by the bird's talons, but as it did not fit closely and was deeply pleated, the talons had only grasped the material, and given Gromeko nothing worse than some severe scratches. They revived the botanist and bound up his wounds, and while he was recovering, Papochkin and Maksheyev went to the crest of the ridge where the bird lay. It was a griffon-vulture¹ of fantastic size: more than twelve feet across the wings and nearly five feet from beak to tail-tip; the feathers were dark brown above, and light brown with dark stripes below. Round its almost naked neck was a large collar of greyish feathers, and there was a big yellow excrescence at the base of its monstrous beak.

A bird like this could easily carry off a sheep, a goat or a small pig, but a man of eleven stone was a weight beyond its strength, and it had evidently mistaken the botanist for a brown quadruped browsing in the grass.

They measured and photographed the griffon with its wings stretched out on the rocks. Gromeko came up to have a look

¹ Griffon-vultures—large birds of prey resembling eagles but having the head and neck almost naked, with a collar of feathers. They are found in warm countries and feed for the most part on carrion, which they are able to discern from the air at very great distances.

at his attacker. He told his companions that when the bird had suddenly seized his back, he thought that it was the tiger, and fainted from shock.

"Shouldn't we go back to camp now?" said Papochkin. "We've been attacked by boars and a griffon, and seen a tiger at close quarters today; haven't we tempted Fate enough?"

They were all tired by their long walk and the day's excitements and were glad to make their way back, carrying the piglets, the hams and fat sides of the boar, and their specimens of rocks and plants.

As they approached the tent they heard General barking furiously, and hurried to his aid. On coming to the grass beside the river-bank they saw that the dog was barking from behind the tent at a huge hippopotamus which was half in and half out of the water. The monster evidently wanted to graze or lie down on the grass, but was taken aback by the dog's yapping; it stared dully with its tiny eyes at this strange noisy creature, and, from time to time let its terrifying mouth gape open, showing its few long teeth and enormous pink tongue. At this, General howled with fright. When it caught sight of the men the monster clumsily turned away, splashed gently into the water and drifted off down the river, exposing its broad fat back covered with little warts.

"It's a good thing we returned when we did," said Gromeko, untying General. "That monster might have given us a lot of trouble, torn down the tent, trampled all our things and sunk or damaged our boats."

"Are the boats still intact?" exclaimed Maksheyev, rushing to the bank, from where he shouted again:

"One's here all right, but the other's vanished! Perhaps that ugly brute broke the mooring rope?"

"We must hurry after it before it drifts too far!" cried Kash-tanov, who had also rushed to the bank.

The two of them seated themselves in the remaining canoe, clutching their guns in case of need, and set off, drifting with the current. They soon caught sight of the missing boat; instead of drifting downstream it was whirling round in one spot in mid-stream. They drew alongside, and Kashtanov was about to grapple it with a boathook when the boat suddenly moved aside like a live thing, and was carried further on, but faster than the current. They had to overtake it again; Maksheyev rowed

as hard as he could, while Kashtanov stood up, holding the boathook.

"Something's pulling it," he exclaimed, as the boat began moving away again in jerks just as they got to it.

"Perhaps the hippopotamus is pulling it. One of its feet may be caught in the mooring rope, or it may have the rope in its mouth."

"There it is," cried Kashtanov, who had noticed the broad back and head of the hippopotamus as it came up for air, ahead of them.

"If we fire it will only swim away still faster or drag the boat to the bottom."

"The only thing to do is to catch up with it and cut the rope."

Maksheyev tugged at the oars once more. Soon they had managed to grapple the boat with the boathook and pull along it to the bow, where it was being towed by the hippopotamus. Kashtanov quickly severed the taut rope, the end of which at once disappeared under the water.

"A little more of that would have finished me!" said Maksheyev, drawing breath after his efforts. "If it were not a waste of ammunition I'd like to give that ugly brute a bullet in the back for playing such a trick on us."

"We're a long way from the tent now," observed Kashtanov.

"It's a matter of rowing against the current this time. Let me take the oars while you have a rest."

They changed places and, towing the rescued boat, made their way back upstream.

"Our river's got quite deep," said Maksheyev, trying to punt the boat along with the boathook and finding it impossible to touch the bottom, which was six feet down. "It's not surprising that there are such large animals in it. From now on we'd better drag the boats ashore at nights and when we go off on expeditions."

The boat moved quietly upstream over the dark surface of the water between green walls of bushes and trees. Other bushes, their roots sapped by the river, bowed and dipped their branches in the water. Large, beautiful butterflies fluttered and bees buzzed around the big, scarlet flowers of an unfamiliar climbing plant.

The water rippled beneath the bows of the boat, the oars

splashed rhythmically, and from the thickets came the twittering of birds. Maksheyev leant over the side watching the fish which appeared here and there and then vanished into the depths.

"How attractive these surroundings are, seen from a boat," he remarked. "But if you set foot on the bank you can't pass through the thicket, you can't take a single step without meeting some poisonous creature or beast of prey. It's hard to believe that after a long struggle against ice, fog and snow we are rowing along a river on the inner surface of our earth; and that a landscape like the virgin forests of Africa or of South America exists so near all that ice. It would be interesting to know what latitude of North America we are under at this moment."

"That's not hard to work out, if we trace our route on the map, beginning from the wall of ice. I think that we are still only under the Beaufort Sea, in a very high latitude, or at most below the tundra of the North Alaskan coast. It's devilish cold there, with ice and Polar bears, while here we have luxuriant vegetation, tigers, hippopotami, snakes."

At that moment Maksheyev saw the reflection of the sun clearly in the water; he quickly looked up and exclaimed:

"Hullo, our little red sun is out in a clear sky at last—look!"

The explorers, who had grown used to seeing Pluto only through a veil of mist or clouds, still had no idea of the colour of the sky, or of this glowing kernel of the earth. Now this veil of mist was torn and had become cumulus clouds, in the gaps of which they could see a clear sky of a very dark blue.

At the zenith stood Pluto, its diameter seeming a little larger than the apparent diameter of the sun.

This underground or "interior" luminary was like the sun just before setting or soon after rising, when it shines through a thick layer of atmosphere. They could make out a number of dark spots of various sizes upon it.

"This central luminary, or true kernel of our earth, is already in the last stages of combustion; it is a red star in the process of extinction. After a short time it will cease to burn. Darkness and cold will descend on the interior of the earth and all this rich life will gradually die out," said Kashtanov.

"What luck that we've managed to break in and study it first," exclaimed Maksheyev. "If we'd come a little later we should have found nothing but darkness ahead, and had to turn back."

"Well, of course, I used the words 'a short time' in the geological sense. In terms of terrestrial years the period is probably equivalent to entire millennia, so that remote descendants of ours will still be able to study this inner surface of the earth, and even colonise it."

"Thank you very much! Fancy settling in a country doomed to perish in the darkness of eternal night!"

XX

A TROPICAL THUNDERSTORM

TIME passed quickly in lively conversation, and both boats duly drew in to their moorings at the camp-site where Papochkin and Gromeko were waiting with supper ready. Sucking pig, both boiled and roasted, seasoned with the botanist's wild onions, proved delicious. The explorers decided to gather more edible fruits, roots and grasses in future, so as to have a varied diet. They had left their tinned vegetables and cereals in the tent at the edge of the tundra, and had brought only tea, sugar, coffee, biscuits, condiments and vitamin extracts. Shooting and fishing were to provide most of their diet, which would be supplemented by local flora.

When the explorers went to bed they lit a big fire near the tent and took turns to stand guard in case of attacks by beasts of prey. While on guard-duty each of them heard rustlings and cracklings, and the fluttering and twittering of frightened birds in the woods near by, and General often pricked up his ears and howled.

Next day, for the first few hours of drifting the landscape remained much the same—knolls, wooded on the northern side, steppe-like on the southern, and dense forest along the banks of the river. They pitched their camp for the day on the left bank, and Kashtanov and Gromeko climbed along it after lunch.

There were many new plants—even some evergreens, such as

myrtle, laurel and cherry laurel. There were nut trees as large as oaks, beeches or elms; on the south sides of the knolls there were beeches, cypresses, thuyas and yews. Splendid magnolias dropped their large, white, sweet-smelling flowers. Bamboo and lianas grew in the riverside thickets. Every step brought fresh joy to Gromeko.

The temperature of the air reached 77 in the shade that day, for the north wind had dropped at last. The air had become heavy, saturated with the exhalations of the dense forests. The explorers climbed knolls with difficulty, perspiring profusely, though the sun was shining only dimly through a veil of cloud.

The intense heat seemed to have stupefied the whole of nature and the birds and beasts took refuge in the shade.

Kashtanov and Gromeko sat down on the top of the knoll to get their breath. Looking north to survey the surrounding terrain they saw the cause of the intolerable heat. A huge purple storm-cloud like a serrated wall had arisen and was advancing towards them, preceded by a blue-black rampart of clouds streaked by vivid lightning flashes. This rampart was bearing down on them with great speed.

"We must run to the boats," cried the botanist. "There's going to be a tropical downpour."

They hurried down the hillside, tripping up in the long grass and sliding down the steeper places. Within ten minutes they had reached the camp-site, where Maksheyev and Papochkin were waiting for them nonplussed and impatient. The tent was not capable of standing up to the torrential rain that would fall nor to the hail that would probably accompany it. The river might overflow, sweeping away uprooted trees, so that even in the boats they would not be free from danger. The best plan seemed to be to drag the boats and their contents on to the bank, and to take refuge in the bushes.

Papochkin remembered that lower down the river he had seen, during a short trip in pursuit of a large water-snake, an overhanging rock at the edge of a knoll which might offer shelter from the rain. But they must hurry, for the thunderstorm was rapidly approaching. They all leapt into the boats, and floated down to the suggested spot, and within a few minutes everything had been unloaded and dragged under the rock; this proved large enough to protect the men and their belongings, the dog, and even the boats, which sheltered them against the wind.

After chasing away a few small snakes hiding in clefts in the rock, the explorers sat back and watched the awe-inspiring spectacle of an atmospheric cataclysm.

The blue-black rampart had rolled across half the sky and hidden the sun; from below it now looked pitch black, like an abyss cut across by blinding zigzags of lightning, accompanied by unimaginably violent claps of thunder. At one moment there was a series of deafening explosions, at the next a cracking noise as though huge pieces of strong fabric were being torn; at another, the sound of salvoes fired by hundreds of heavy guns.

The forest roared hollowly under the first gusts of wind. A frightful din came from the north, making everything quiver and gradually drowning even the rolls of thunder. It was as though a gigantic train was hurtling towards them, crushing everything in its path.

The explorers, white with anxiety, gazed around them.

The tempest was already upon them, bringing a whirlwind of leaves, flowers, twigs, branches, whole shrubs torn up by the roots, and birds which had not succeeded in escaping into the depths of the forest. Everything grew darker and darker. A frenzy of whistling, hissing and crackling alternated with the deafening peals of thunder. Enormous raindrops and occasional hailstones pattered on the ground and splashed in the water, which seethed and foamed. Then complete darkness supervened, and they could only see by momentary lightning-flashes the terrible scene around them; it was as though the whole forest had been lifted into the air and was being swept away in floods of rain and hail. The thunder drowned even the loudest shout right in the ear.

But the tornado only lasted about five minutes. Daylight swiftly returned, the gusts of wind slackened, the roaring and the thunder moved away southward and the rain declined to a drizzle. The river however had swollen, and become reddish-brown and muddy; it was covered with foam and carried along leaves, twigs, branches and whole trees. Fragments of grey cloud still sped across the sky, but Pluto was already shining through, lighting up the devastation caused by the storm.

The explorers emerged from their shelter and looked about them. Beside their boats they found leaves, branches and twigs piled up, mixed with hailstones the size of walnuts. Some sharp

branches had been hurled by the wind so violently that they had pierced the sailcloth sides of the boats, which had to be repaired forthwith. The explorers got out needles, thread and pieces of tarred sailcloth and set to work.

Mending the boats took nearly an hour, and meanwhile the river sank back between its banks and became clear of debris, so that they were able to continue their voyage. The black cloud had already disappeared beyond the knolls to the south, and for the first time the explorers saw a completely cloudless dark blue firmament.

"And to think," said Papochkin, after getting into one of the boats, "that directly above our heads, beyond this dark-blue sky, about six thousand miles away, there's a country just like this, with forests, rivers and all sorts of animals. How interesting it would be to see it above our heads!"

"The distance is too great," said Kashtanov. "A layer of air of such thickness, with floating particles and steam in it, can't be transparent enough, and country that is covered with greenery doesn't reflect much light, it's too dark."

"But did you notice," asked Maksheyev, "that when we were looking round yesterday from the top of a comparatively low hillock, the visibility of the horizon was much better than it is up there? We could see a wooded plain probably as much as sixty miles away, thanks to the fact that the surface which we are traversing is not convex, as on earth, but concave. It's as though we were standing on the bottom of a flat bowl."

"In theory, our field of vision should be unlimited; we ought to be able to see the country not just fifty miles but two hundred or five hundred miles away, rising higher and higher, up to the sky. At great distances, however, the lower layers of the atmosphere cease to be sufficiently transparent, and the outlines of objects become gradually more diffuse, and merge into one another.

"Consequently, the line of the horizon here cannot be as distinct as it is up on the outer surface. Strictly speaking, there isn't any horizon here at all; what we see is a gradual transition from the ground to sky. But up to now, the low clouds and mist have prevented our seeing this."

Towards evening the river grew considerably broader, but the current slowed down so that they had to keep on rowing, so as to keep the boat moving as fast as they wished.

From time to time they saw gaps in the green walls on either side, where the water wandered off into narrow backwaters or where these backwaters rejoined the main stream. Islands appeared in the midst of the main stream, fringed with thick beds of reeds.

As they were skirting one such island the explorers noticed a gap in the belt of reeds, from which a track led into the green thickets.

Maksheyev turned his boat into the gap, intending to draw up to the bank and have a look at the island. But no sooner had the boat bumped against the shelf of silt surrounding the island, than a sabre-toothed tiger thrust its head out of the thicket. Two shining white fangs, like a walrus's, each about a foot long, projected from the upper jaw. But the beast was evidently replete, and had no intention of attacking. It opened its great mouth wide, as though yawning, and then withdrew into the thicket. The sight of this terrifying beast decided them against landing on the island.

Next day the river narrowed again and the current grew swifter. The vegetation became more subtropical in character: oaks, beeches and maples disappeared, and were supplanted by magnolias, laurels, rubber trees and many others which the botanist knew only by name or from stunted specimens seen in hothouses. Yuccas, fan palms and sago palms could also be seen from the boats.

The hillocks were fewer, and lower, but broader than before. Thick grass grew waist-high on their slopes, and there were isolated trees and copses that reminded the explorers of the gallery forests of Central Africa. Dense undergrowth covered the banks and the lower-lying country.

The explorers stopped for their meal not far from one of the hillocks, intending to visit it and study the flora at length. Maksheyev consented to stand guard over the boats and the other three set off after dinner for the hillock.

XXI

THE MOVING MOUND

THEY had to hack the first few yards of their way with the axe through a jungle of lianas and bushes. After that the undergrowth became less dense. Huge eucalyptuses, myrtles, laurels and other trees formed a lofty green canopy beneath which semi-darkness reigned. Between the beds of ferns and the boles of the trees the soil was covered with moss of different kinds and with magnificent orchids. Insects chirruped high overhead, but below all was silent. From time to time a snake or a lizard glided noiselessly by.

Nearer the hill the woods became thinner and Pluto's redish beams penetrated as far as the ground. Here there was more life; bushes, grass and flowers grew more freely. The explorers came upon a track that wound among the trees, and followed it hoping it would lead them out of the forest. Kashtanov walked in front with Papochkin behind him, both with their guns at the ready, keeping a close look-out all round. Gromeko followed them, stopping frequently to gather plants.

Suddenly Kashtanov halted and raised his hand in warning. Ahead of them they heard a loud crackling and a low growling. Then a gigantic animal appeared in their path, unlike any they had seen—it resembled a bear but had a long, fluffy tail and a long, narrow head.

"It's an ant-eater," whispered the zoologist. "There are several kinds in South America which are quite inoffensive, in spite of their alarming appearance and huge claws. But those are much smaller than this specimen—why, it's over six feet high!"

Meanwhile, the ant-eater had spotted the men barring its path and had halted irresolutely.

"Let's leave the path," whispered the zoologist. "Perhaps it will come past and give us a chance to have a better look at it."

The explorers moved aside and hid in some dense bushes. The ant-eater stood still for a few minutes, gazing suspiciously into the thicket, then advanced little by little, stopping every few paces and looking round. As it was pausing Papochkin managed to photograph it from the side; but when the creature heard

the click of the shutter it began to run, rocking on its thick paws, its tail outstretched. From nose to tail it measured a good twelve feet.

Leaving the forest, the travellers found themselves at the foot of a hillock which sloped gently upwards from where they stood. Kashtanov gazed with disappointment at this smooth slope, which promised him no spoil, whereas the botanist was delighted with the wealth of unknown flowers among the thick grass, and immediately began picking them. Then suddenly the geologist noticed, at the very foot of the hill, a dome-shaped mound, the bare surface of which gave off a metallic glint.

"Ah, something for me at last!" he exclaimed, pulling out his hammer and almost running toward the mound, while Papochkin chased a strange lizard which was trying to escape up a small tree.

When he reached the mound Kashtanov halted in astonishment, for it was completely bare, without the faintest trace of grass, and its surface consisted of hexagonal plates, light-brown in colour, with dark rims.

When the amazed geologist tried to knock loose a small piece of rock with his hammer, the tool bounced off the surface.

Hoping that the top of the mound would have more cracks, Kashtanov climbed up to it. At first he found this difficult, for though the mound was only about nine feet high, its sides were completely smooth. At the top, the rock was just as invulnerable as below, so the geologist drew a large chisel from his belt, placed it in the fissure between two plates, and began hitting the chisel with the hammer; the chisel's sharp edge gradually sank into the rock.

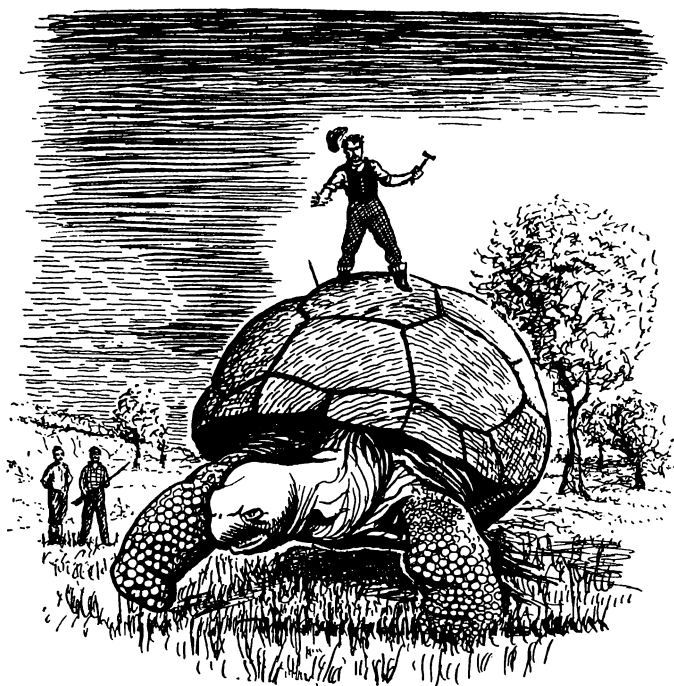
Suddenly a powerful jolt knocked over the kneeling geologist, and he only saved himself from falling off by hanging on tight to the chisel. There were further jolts, and Kashtanov gazed around him in perplexity. It seemed to him that the ground was moving and the trees were rocking from side to side.

"What a frightful earthquake!" he shouted to his companions, who were forty yards away. "Can you feel these jolts too?"

Gromeko and Papochkin looked at each other in surprise. They had felt no signs of any earthquake. But when they looked at Kashtanov they were astounded—the mound, with the geologist on it, was slowly moving away up the side of the hillock.

After the first shock of surprise, they ran to intercept the strange moving mound, the base of which was hidden by the thick grass. On getting near it, Papochkin burst out laughing and exclaimed:

"It's a giant tortoise! Pyotr Ivanovich, you're riding on a tortoise!"



At that moment the mound turned towards its persecutors, and they saw a longish neck and a repulsive head as big as a bull's.

At that moment the mound turned towards its persecutors, and they saw, stretching out from under it, a longish neck and a repulsive head as big as a bull's, covered with little scales. The creature's open mouth revealed lamellar teeth.

Kashtanov, recovering from his surprise, left his chisel stuck in the tortoise's armour, leapt from its back and jumped aside. He had noticed the huge tail, like a stout log, which was beating

about and could have smashed his legs with a single blow.

Relieved of its burden, the animal hurried off round the slope, its head and tail hidden in the grass. Once more it looked strikingly like a bare mound in motion.

After cracking jokes about the geologist's adventure, Kashanov remarked:

"You know, I don't think it was a tortoise at all, but a glyptodon, one of the armadillo family that lived on the earth in the pleiocene epoch of the tertiary period, along with huge ant-eaters, giant sloths, mastodons and enormous rhinoceroses. A great many remains of these have been found in South America."

"Well, we did meet a big ant-eater in the forest," Papochkin reminded them.

"It was that meeting that gave me the idea. You see, when we were in the northern zone, near the edge of the ice, we met with live fossils like the mammoth, the long-haired rhinoceros, the primitive ox, the cave bear and the giant reindeer, which lived on earth in the post-tertiary period; so it's not surprising that further south where it's so warm we should meet still more primitive creatures, of the pleiocene¹ age."

"Well then, to pursue your idea, the farther south we go, the more ancient the fauna we shall meet—miocene, eocene, cretaceous, jurassic and so forth?" asked the zoologist somewhat sceptically.

¹ The geological chronology of the life of the earth has been defined as follows, beginning with the present day and going back to the earliest times.

<i>Eras</i>	<i>Periods</i>
1. Cainozoic (era of new life)	Quaternary Tertiary
2. Mesozoic (era of middle life) or secondary.	Cretaceous Jurassic Triassic
3. Palaeozoic (era of ancient life) or primary	Carboniferous Permian Devonian Silurian Cambrian
4. Proterozoic (era of first appearance of life)	Each divided into upper, middle and lower periods
5. Archaean (era without life)	

Each period is divided into epochs: the tertiary period comprises the pleiocene, miocene, oligocene, eocene and palaeocene epochs.

"I should not be surprised," said Gromeko. "Since we discovered this strange intra-terrestrial world I'm not surprised at anything and I'm ready to say hullo to iguanodonts, plesiosaurs, pterodactyls, trilobites¹ and any other paleontological marvels you like."

"In that case it's a pity we didn't shoot the ant-eater and the glyptodon. How shall we be able to prove their existence? I didn't even photograph that glyptodon."

"Perhaps we'll meet them again."

"Incidentally, it's time we renewed our stock of meat," observed Gromeko. "Otherwise we'll only have pork fat to eat tomorrow."

While they talked the explorers were slowly climbing the hill and reaching its crest; along this ran a fairly narrow strip of thick bushes, under which, to Kashtanov's joy, were some outcrops of rock. The geologist set to work with his hammer, but Papochkin who had crossed through the bushes, stopped him with a warning: "Quiet! there's a whole zoo grazing on the far slope."

Kashtanov stopped hammering, pocketed the specimen he had chipped off, and walked through the bushes, followed by Gromeko.

On the gently sloping southern side they saw a variety of animals peacefully browsing. Nearest them was a family of rhinoceroses very unlike either the rhinoceroses of India and Africa or the long-haired rhinoceros they had already met. These were stout, squat, short-legged creatures, more like small hippopotami, except for the shape of their heads and the short, thick horns of the males. Instead of a horn the female had a large corn-like bump. A young one, frisking beside its mother, looked like a large liver-sausage. To get at his mother's milk he lay on the ground and thrust himself sideways under her belly; when she moved, nearly squashing him, the indignant little creature grunted angrily.

A little further up the slope a herd of enormous elephants were grazing. Looking at them through his field-glasses Kashtanov said they must be mastodons; they differed from the

¹ Trilobites—an extinct variety of crustaceans. The trilobite's body is made up of three sections (whence its name): the head-piece, the body itself, consisting of a number of segments, and the tail-piece. It appeared in the Cambrian period and became extinct in the Permian. We shall meet the other creatures mentioned by Gromeko later.

mammoths they had already met in having long, straight tusks, retreating foreheads and longer bodies.

Near them there were a number of immense antelopes, brownish-yellow with black spots like a leopard's and long sabre-like horns. They moved in leaps, their hind legs being considerably longer than their forelegs; at first Gromeko took them for big hares.

There were some still stranger animals at the fringe of the forest. These resembled giraffes in that they had very long necks and small horns on their heads, and they also resembled camels in their light-brown colour and in their shape and the small hump on their backs. A pair of these animals in which Kashtanov recognised the common ancestor of the giraffe and the camel, were walking along the edge of the forest, plucking twigs and leaves without difficulty at twelve feet from the ground.

The most interesting finds seemed to be the antelopes and the camel-giraffes, so the party broke up into three. Kashtanov approached the camel-giraffes by a roundabout way while Papochkin stole up to the antelopes, and Gromeko undertook to photograph the rhinoceroses and mastodons.

Gromeko, tempted by the little rhinoceros, which seemed to him most spit-worthy, fired at and killed the unsuspecting infant. Its parents, instead of running away as the hunter had expected, sniffed the carcass and then, with loud grunts, hurled themselves at the botanist, who had been imprudent enough to show himself. He retired into the bushes and had hardly had time to move aside when a crashing of branches sounded from the spot he had just left and both the rhinoceroses appeared, after trampling down the bushes and scattering them with their snouts, on the crest of the knoll; they rushed on, but finding that their enemy had vanished, turned back and plunged towards the bushes where a stirring betrayed the hunter's presence.

At that moment a shot from Papochkin's gun rang out near the antelopes, and the whole herd galloped up the slope, followed by the mastodons, waving their trunks with fearsome trumpeting. Gromeko's position was desperate—he had to keep an eye on the rhinoceroses and dodge them in and out of the bushes, while he was in danger of being trampled by the antelopes and mastodons. But he had a brain-wave; seeing that the antelopes and mastodons were charging up the slope from different



. . . hurled themselves at the botanist.

directions but towards the same point on the crest, he stopped dodging about and ran down the slope towards the gap between the antelopes and the mastodons, hoping that either one or the other of these would hold up his pursuers. This calculation proved justified. One of the two enraged rhinoceroses collided with the mastodons, the other with the antelopes. Confusion followed. The first rhinoceros was knocked down and trampled on, while the second put the antelopes to flight and ran after them, leaving Gromeko master of the field.

Breathless from his headlong escape, he went back to the bushes, found the gun, which he had thrown aside in his flight and then set out to search for his victim, the little rhinoceros which had been the cause of his scare. It was not hard to find, as its round body, like a barrel, could be seen from far off in the trampled grass. Then he rejoined his companions, and they went back heavily laden with skins, skulls and meat, to the camp, where Maksheyev was getting worried at their long absence. Though he had stayed in one place he had managed to kill an animal which had sneaked up to the tent, probably hoping to make a meal of General. This was a creature like a wolf, but with a very large head, a catlike body and a longish mane on its head and neck. Kashtanov declared it must be the pleiocene ancestor of the present-day wolf.

XXII

ECLIPSE OF PLUTO

WHILE the antelope meat was cooking in the pan and the young rhinoceros roasting on the spit, the explorers sorted out the wealth of material collected during the day.

While doing this they noticed that the light had grown dimmer and become redder than usual. Looking up to see what had caused this phenomenon, they were surprised to find that the sky was cloudless but Pluto itself was shining wanly, and had a number of large dark spots scattered over its disc.

As the light faded, the temperature, which during the day had reached 82 in the shade, began to fall. They would have welcomed this had not the fading of the light made them somewhat anxious.

"Suppose Pluto goes out altogether?" asked Gromeko, as they observed during supper that the light continued to grow dimmer and the number of dark spots increased.

"And we suddenly find ourselves in complete darkness, gradually followed by Arctic cold?" added Papochkin.

"And we've left our warm clothing far off in the north, in our tent!" exclaimed Maksheyev.

"I think this fading of the light is a temporary phenomenon," said Kashtanov. "Judging by the red light and the dark spots, Pluto really is in the last stage of combustion. But this can last for hundreds and thousands of years. Stars similar to Pluto which we observe in the universe sometimes fade and nearly go out, but then blaze up again. There are great reserves of heat in their interior, and the crust formed on their surface as a result of cooling—which appears as the dark spots which we now see—is often broken and dissolved by this interior heat. A luminary doesn't become extinguished all at once."

"But suppose Pluto stops burning through lack of oxygen? After all, its supply is taken from the atmosphere of our planet, drawn in through the Arctic opening."

"I doubt it, for if so Pluto would have consumed all the oxygen in our atmosphere during the millions of years it's been burning and the earth's inhabitants would have been stifled by nitrogen long ago. We know very little about the combustion processes of the luminaries of the universe; perhaps these processes are different from those on earth. It is possible that oxygen is re-constituted as a by-product of other chemical elements disintegrating. Recent discoveries concerning the transformation of radium have made us take a new view of the constancy of the elements, which used to be considered indisputable."

"Well, 'there are more things in heaven and earth, Horatio, than are dreamt of in your philosophy'; our visit to Plutonia is proving Hamlet right every day!" observed Gromeko; and suggested they take advantage of the coolness and the dark and go to bed.

The forest creatures had also sensed that something was going wrong in nature. The birds had fallen silent; animals'

anxious cries could be heard instead of their singing and chirruping. From time to time General threw back his head and howled.

But regardless of these noises the explorers, who had lit a fire in front of their tent, slept soundly and even longer than usual. When they woke up, it was still as dark as before. Everything was wrapped in a reddish twilight, and Pluto's disc was covered with dark spots, which reduced its light by nine-tenths. Leaves and grass looked almost black and so did the sky. Silence reigned around—neither birds, nor beasts, nor insects gave any sign of life; a slight breeze occasionally stirred the vegetation, that was all. There was something sinister in this silence.

After discussion they decided that it would be risky to drift in this semi-darkness down an unfamiliar river flanked by forests crowded with beasts of prey—they might be attacked; it would be easy too, to run aground on a sandbank or strike a sharp reef, which would be very dangerous for their canvas boats.

"But suppose this twilight goes on for whole weeks or months?" asked Gromeko. "Surely we're not going to stay here? Our stock of food will only last three or four days."

"What a queer fellow you are!" replied Kashtanov. "Now you're jumping to the gloomiest conclusions. Let's wait a day or two, then consider whether to go on or back."

"And while we're waiting let's repair the boats, and build a raft and get the other chores done," said Maksheyev. "The boats are leaking already."

Everyone agreed and they got down to work by the firelight. They repaired the boats and sawed off a number of large bamboos growing near the camp-site—a lengthy job as the carpenters had only one small hand-saw between them. Then they cleared the bamboo trunks of twigs, sawed them into sections of the same length as the boats and fastened them together, making a raft five feet wide, to be set between the two boats. Their idea was to pile the bulkier things they were carrying on the raft, covering them with skins. This would form a sort of ferry, firm, light and easy to manœuvre.

This work took up a whole day, during which the number and size of the dark spots on Pluto remained unchanged. The explorers went to bed early, leaving a small fire burning beside

their tent, and General stretched out across the entrance; they counted on a quiet night's sleep, only going out from time to time to make up the fire.

Their confidence was not entirely justified, however. As soon as all was silent in the tent, rustling sounds began in the surrounding thickets; General pricked up his ears and began howling. The rustling stopped and the dog quietened down; but then the rustling began again, as though some beast was prowling through the bushes around the camp watching its prey but hesitating to leap out upon it. They decided to take turns as sentries, and Papochkin was the first to settle down by the fire, gun in hand. The rustling sounds kept retreating and approaching, and the zoologist at last grew so used to them that he fell sound asleep. The fire gradually went out and became a heap of smouldering embers.

Suddenly the dog began to bark furiously. Papochkin woke up and saw a large animal standing at the edge of the clearing. It was like a lion but had a shorter mane and fangs like those of a sabre-toothed tiger sticking out of its half-opened mouth. The animal had halted irresolutely and General was backing away towards the tent, barking hard, but with his tail between his legs.

The zoologist pulled himself together, lifted his gun and fired at the animal, which was about twenty paces away. The bullet struck it in the chest, but it still had the strength to make a leap which landed it on the heap of embers. Its belly scorched, it rolled off against the tent. One of its hind paws struck against the canvas, ripping it from top to bottom and catching in Maksheyev's boots which he was using as a pillow. One of its front paws, jerking convulsively, almost hit Kashtanov in the face, smashed his watch, which lay in his hat on the ground, and tore the hat itself to tatters. General, cowering at the entrance to the tent, was hurled inside by a blow from a third paw, and badly scratched. The dog fell on Gromeko, who was fast asleep at the back of the tent.

Indescribable confusion followed. Something enormous was threshing about and roaring in the semi-darkness outside, tearing the tent into ribbons with its blows. Inside, Gromeko was struggling with General, who was trying to hide behind him and whom he mistook for a wild beast. Kashtanov was groping for the matches which he had put in his hat beside his watch,

and could not even find the hat. Papochkin shouted from outside:

"Get out by the back way at once. It's a lion, and I can't finish it off for fear of hitting you."

At last the animal stretched out its paws in a spasm and gave up the ghost. Maksheyev found his matches and lit a candle. Gromeko released General and, half-dressed and scared stiff, the three men unfastened the rear flap of the tent, crawled out and looked around them. Gathered round the dead fire, they questioned Papochkin, who had to admit that he had fallen asleep and let it die, so that the animal had decided to attack.

The creature turned out to be a sabre-toothed lion, though the shape of its body also made it resemble a bear; only the form of its head and paws showed its affinity to the cat family. The mane was short, almost black, the hair on the body yellowish-brown, the tail had no brush. The claws on its huge paws corresponded to its terrifying fangs.

The tent needed urgent repairs and so did Maksheyev's boot. After a prolonged search, Kashtanov's watch was found—flat as a pancake—along with the tattered hat and the squashed matchbox, in a corner of the tent.

Gromeko pulled General, still trembling, out from behind one of the beds, examined him and bathed his wounds. Then, they dragged the lion aside, and decided to resume their interrupted sleep. Maksheyev stood guard, and the rest of the night passed undisturbed. When morning came they found the twilight less gloomy and the number and size of the dark spots on Pluto apparently decreased. They made up their minds to wait a while, and proceeded to mend the tent and to measure and skin the dead lion. By lunch-time it had become still lighter and a little later Pluto, as though recovering its strength, absorbed most of the spots covering its disc and shone out with a radiance which seemed especially bright after the forty-hour twilight.

The explorers quickly assembled their belongings, loaded them on to the boats and the raft, and floated onward, but not as fast as before; their craft seemed less mobile than they had hoped, and they had to row with great vigour. Towards the evening the terrain began to change, the knolls along the river banks getting lower and finally disappearing. In place of dense thickets steppe-land stretched away on either side, dotted with isolated groves of trees, mostly giant baobabs. Only the banks

showed a narrow strip of lush vegetation, including palm-trees, bamboos and lianas, the home of various birds and large apes of different kinds. Herds of antelopes of several varieties were grazing on the steppes, with mastodons, rhinoceroses, camel-giraffes, hornless giraffes and primitive horses. Tigers, hippopotami and deer sheltered in the thickets by the river.

XXIII

MONSTROUS LIZARDS AND QUEER BIRDS

THEY spent their first night on a large grassy island with occasional groups of bushes and reed-beds along the banks. They pitched their tent on the northern end of the island whence they could see the river dividing into two channels, each about a hundred yards wide.

After supper the peace of the surrounding countryside was broken by an uproar. They heard prolonged cries coming from the opposite bank which reminded them of the shouts of a human crowd; and these noises were occasionally drowned by loud, jerky barks and howls.

A small herd of quadrupeds, reddish with white spots, suddenly burst out from the thickets, trampling the reeds and thrusting aside the bushes; they hurled themselves into the water and swam towards the island. After them rushed a pack of particoloured animals which also plunged into the river, barking and howling as they tried to overtake and capture one that was lagging behind the rest, evidently exhausted.

In a few moments most of the fugitives had reached the island and were galloping past, close to the tent. They were like horses, except that they had no manes.

The straggler also succeeded in landing on the island before its pursuers, but it had difficulty in climbing the steep cliff, and at the top was surrounded by the howling, barking mob. In a last strenuous effort, it kicked and bit with all its remaining strength, but the unequal struggle against a dozen foes could

not last long. The beasts of prey dodged its blows and did not let it out of the circle they had formed while waiting for it to become exhausted.

The men joined in the battle; three shots fired into the pack laid two of the creatures low and put the rest to flight. But the victim was too far gone to benefit by its unexpected deliverance. When the explorers went up to it, they found it was already at its last gasp. A great ragged wound gaped at the neck, doubtless inflicted by the teeth of one of the attackers when they first fell upon the herd; it was the loss of blood that had so weakened the victim.

On examining its pursuers, the explorers found that they were a species of primitive mammals. They were about the size of Siberian wolves, but their tails and the shape of their bodies resembled those of felines. The fur on their backs and flanks was light brown, with yellow lengthwise stripes, but that on their bellies was yellow. Their teeth were even and fang-like.

The victim could be called a horse only with substantial reservations. It was no larger than a big donkey, but more graceful. Its slim legs terminated not in a single hoof, like a horse's, but in four embryonic toes of which only the middle one was well developed.

After studying this queer creature, Kashtanov and Papochkin came to the conclusion that it was a primitive horse, the ancestor of the horse of today, though more similar in appearance to the American llama.

The following day the steppe-like terrain continued; it was a real savannah or prairie, with tall grass, thickets, and groups of bushes and trees along the banks of the calm river and on the many islands. On one of the larger of these the explorers observed a herd of titanotheria—resembling a cross between hippopotami and rhinoceroses.

They were going to moor a little lower down, behind some bushes, so as to stalk and bring down one of the titanotheria, but before doing so they noticed a still more interesting beast, a representative of the primitive pachyderms—a four-horned rhinoceros, standing drinking with its forefeet in the water. When the raft drew near it, the creature lifted its monstrous head and opened its mouth wide, as though it meant to swallow or at least to spit at the unbidden visitors. Two long, yellow fangs projected from its upper jaw. Two small horns rose between

its little eyes and two more horns, like blunt stumps, stuck up behind its ears.

But while the explorers were mooring and advancing cautiously through the bushes to photograph this interesting animal, it withdrew from the river and lumbered off. Kashtanov and Papochkin followed it and noticed in a nearby clearing an enormous creature standing beside a tall tree and plucking its leaves at a height of about fifteen feet. The shape of its body and the colour of its skin made it look like a twelve-foot-high elephant, but its head and its long neck were unlike any elephant's. In proportion to the body, the head was very small, and resembled a tapir's, with a long upper lip for grasping whole bunches of leaves.

"What a monster!" whispered Papochkin. "The body of an elephant, the neck of a horse, the head of a tapir and the habits of a giraffe."

"I think," said Kashtanov, "that this is a rare specimen of the family of hornless rhinoceroses; remains of these were recently found in Baluchistan, and that's why this colossus, the biggest of land mammals, has been given the name of *baluchitherium*. It lived at the end of the oligocene epoch or at the beginning of the miocene."

"It really is a colossus," said the zoologist, astonished. "I believe that I could walk upright under its belly, just bending my head."

"And if a full-grown Indian rhinoceros stood beside it, the rhino would just about reach up to this creature's belly, and could pass as one of its young."

"What a pity we can't stand beside it to show the scale on the photograph," said Papochkin, as he took a snap. "It seems inoffensive enough but I'd be afraid to go near it; it could break one's bones by a casual movement of one of its legs."

"Photograph the tree beside the animal; later we'll work out the height of the tree."

The watchers waited until the *baluchitherium*¹ had moved away, then, using a mountain compass, determined the height of the tree. They also measured the creature's footprints, which were small in comparison with its stature.

¹ In 1915 an expedition from the Academy of Sciences found in the Turgai region remains of a similar colossus of the same subfamily, which was named the *indricotherium*.



They noticed a pair of coryphodons on the shore of the large island.

Towards evening the same day they noticed a pair of coryphodons on the shore of the large island; these large pachyderms resembled the titanotheria in shape. When it saw the raft the male lifted its head and opened its huge mouth, showing two fairly long and sharp fangs jutting from each jaw.

The explorers were not able to land on the island to hunt these creatures, as a little lower down the bank a large animal was sitting devouring its prey; when it saw the raft it got up and growled threateningly.

This animal had a massive body supported by short, thick legs. Its muzzle was long, like a borzoi's. It was about the size of a very large tiger, so the explorers dared not approach it. Thus they did not kill a single one of these new types of fauna that day.

Next day they saw horses, titanotheria, four-horned rhinoceroses, antelopes, carnivorous creodonts and other animals grazing on the banks and on the islands. Kashtanov considered that the general appearance of these creatures pointed to their belonging to the early part of the tertiary period.

After lunch the party hove-to and set out on a trip into the heart of the steppe, with a view to discovering what it was like.

Beside a lake they came upon an animal which particularly aroused their interest. Like any other herbivore it was nibbling peacefully the juicy stalks of grass. This reassured the explorers, who had raised their guns when they emerged from the bushes on to the shore of the lake and had suddenly seen the monster. Even General, who by now was used to the variety and strangeness of the animal life and could at once distinguish carnivorous from herbivorous creatures, showed extreme fear and withdrew, growling between Maksheyev's legs.

"A colossal rhinoceros," whispered the latter, remaining in the bushes so as not to frighten or irritate it.

But it was only at first sight that the animal resembled a rhinoceros owing to the little horn on the bridge of its muzzle. Two large horns, sticking up from its forehead and pointing forward gave it a likeness to certain kinds of oxen, but otherwise it was unlike either rhinoceroses or oxen. The head was disproportionately large, being nearly six feet long; the back of the skull broadened out into a flat, broad crest which could be taken for huge, spreading ears but was really nothing but an embellishment or protection for the upper part of the neck;

this collar, which was covered with little scales and bordered with sharp teeth, undoubtedly increased the weight of the huge head and prevented the creature from lifting it up.

The animal's front legs were a good deal shorter than the hind legs, so that when it moved it lifted its sacrum high in the air. When its head and legs were hidden in the long grass it looked just like a hillock, nearly fifteen feet high. Its massive body covered with large plates of armour on the back and sides, and smaller plates on the sacrum, legs and belly, ended in a short thick tail which served as a support. From the tip of the beak-like muzzle, to the root of the tail, the animal was almost twenty-four feet long.

"Well, what a monster!" whispered Gromeko as, with the others, he stared at this extraordinary animal, which was advancing slowly along the lake shore, munching grass and branches, and looking like a moving mound.

"What is it?" asked Papochkin.

"It must be a triceratops, one of the dinosaurs," replied Kashtanov; "that's a group comprising a variety of gigantic lizards."

"It's a reptile then? Used there to be horned reptiles?" exclaimed Maksheyev.

"The dinosaurs included a great many different forms of life, carnivorous and herbivorous lizards, large and small, which existed between the triassic and the cretaceous periods."

"So we've arrived in the cretaceous¹ period!" cried Papochkin. "And the further we drift downstream the more such monsters we must expect to meet!"

"Let's hope they're all as harmless as this one," observed Gromeko. "Because if we met a beast of prey of that size it would be no joke—he'd tear us in pieces before we could fire at him."

"Large animals are usually clumsy," replied Kashtanov. "In my opinion sabre-toothed tigers are much more dangerous than these giants."

"We ought to do something to make it raise its head," said Papochkin; "or else entice it to some open space. I've taken

¹ The cretaceous period was distinguished by the development of reptiles which attained gigantic size but became extinct at the end of this period. The beginning of the cretaceous period saw the appearance of the first, primitive mammals—small, ugly creatures.



General rushed towards it with loud barks.

two pictures, but neither will show its legs or the tip of its muzzle."

"Shall we shoot at it?" suggested Maksheyev.

"No, if we do, it will run away or else rush at us. Even an explosive bullet won't knock down a hulk like that in a second."

"Let's set General on to it!"

After a good deal of persuasion they succeeded in making the dog, which was trembling and growling, attack the monster. General rushed towards it with loud barks, but stopped at a respectful distance. The effect of the dog's onslaught was, however, most unexpected. The monster plunged into the lake, splashing up huge fountains and disappeared in the troubled, muddy depths.

They all roared with laughter at this shameful flight, and General, encouraged by his victory, ran down to the shore and began barking wildly at the rings made by the water where it had been disturbed by the reptile. In a short time two of the lizard's horns and its collar reappeared in the middle of the lake as it came up to draw breath. Papochkin, who had his camera ready, had to confine his picture to the head, as at the sight of its strange persecutors, the lizard immediately dived down again.

At another lake, General flushed from the reeds a whole flock of queer birds. These were like large swans, but had longer bodies and shorter necks, and very long pointed beaks, set with sharp, small teeth. They swam and dived splendidly in search of fish. The explorers managed to shoot one of them.

After examining it, Kashtanov decided that it must be a hesperornis, a toothed and wingless bird of the cretaceous period, similar in body-structure to the penguin of today. Its wings were in an embryonic state and quite hidden under its soft, downy plumage.

XXIV

THE ZONE OF MARSHES AND LAKES

AFTER drifting for three days through this area of dry steppe the explorers reached its southern edge, where the vegetation suddenly changed. The river banks were covered with green thickets of coniferous trees, sago palms¹ and ferns of numerous kinds, most of them quite unfamiliar and as high as a man. Tall beds of reed-like plants grew in the water along the bank and the flat sandbanks were covered with horse-tails, five feet high and nearly an inch in diameter. A ceaseless chirring sound came from the depths of the reed-beds and strange insects circled over the surface of the water. These were like dragon-flies but had a wing-span of nearly sixteen inches; their bodies, shot with a metallic glint, were eight inches long; some were a golden yellow, others steel-grey, yet others emerald green, dark blue or fiery red. They fluttered and hovered in the sun-beams, overtaking each other and giving out a melodious cracking sound like the clicking of castanets.

Struck by the beauty of the sight, the explorers shipped their oars. The boat drifted with the current while the oarsmen admired the unusual scene. Papochkin got out his net and after prolonged efforts managed to catch a dragon-fly; but when he took it out of the net it bit his finger so sharply that, flabbergasted, he let it fly away.

The unbroken barrier of green along the bank gave the explorers no chance to land; tired out by their long journey, they looked in vain for even the smallest stretch of grass where they could camp for the night.

Meanwhile they grew hungrier and hungrier, and the green walls grew thicker and thicker.

"Oh dear, we ought to have halted at the end of the steppe," said Gromeko.

¹ Sago palms—the only family of the order of cycads in the class of gymnosperms, with tree-trunks like those of palms. The core-pith is well developed, rich in starch and yielding sago. Sago palms grow in hot climates, and there are eighty-three varieties of them. They were prominent among the flora of former geological epochs, appearing as early as the carboniferous age and being characteristic of the jurassic and cretaceous ages. The sago palms of today made their appearance at the end of the cretaceous age.

"We'll know better next time," laughed Maksheyev.

Mile followed mile without any break in the green walls. At last, at a turn in the river, a low, green strip appeared on the left bank. A long, narrow spit of land jutted into the water, ending as a sandbank, on which nothing but reeds grew. For lack of anything better they decided to halt here.

Bringing the boats into the little bay between the spit of land and the bank, the explorers pulled out their knives and attacked the reeds. This, however, was no easy task; the stout stems, stiff with silica, stubbornly resisted the knives, and even when cut left a prickly stubble on which nobody could either sit or lie down.

"Let's try pulling them up by the roots," suggested the botanist. "They can't be very strongly set in this soft river silt."

This turned out to be a good suggestion. The reeds came out easily, and within half an hour the explorers had cleared a space large enough for the tent and the fire. But they had nothing with which to make a fire: the green reeds would not burn. It was impossible to cook supper or even to make tea. Moreover, swarms of gnats, three-quarters of an inch long, emerged from the reeds, and filled the air, and only the smoke of a fire would keep these at bay.

"Just a minute," said Gromeko. "Quite near here, as we were coming along, I noticed the trunk of a dry tree sticking out of the bushes. That's what we need!"

Armed with axes and rope, Gromeko and Maksheyev detached one of the boats from the raft and rowed up stream. At about a hundred paces from the camp-site a stout, withered tree with a few branches on it stuck out of a green thicket; but it was so high above the level of the water that they could not reach it either with hand or axe.

"Let's try to hitch the rope over a bough—perhaps it will break off," suggested Maksheyev.

Gromeko held the boat still by grasping some reeds while Maksheyev threw the rope over a thick branch and began pulling. The branch did not break off, but the whole tree began to crack.

"Let go of the boat and help me pull!" he shouted to his companion.

Now they were both grasping the rope, standing up in their frail boat and hauling with all their might. The tree crashed

and fell heavily across the bow of the boat, which began to sink under the weight. Gromeko only just managed to grab some reeds and drag the stern on to them as the bow disappeared under the water.

"Here's a how-d'-ye-do! What are we going to do now?" exclaimed Maksheyev. Both men were sitting on the stern, their legs in the water, grasping the reeds with one hand and with the other holding the rope, which was preventing the tree from drifting away with the current.

"We can't land on the bank and we can't bail out the water, so the only thing is to call for help," said Gromeko.

They both began hallooing and calling. At first they got no answer, but eventually Kashtanov's voice was heard asking what was the matter.

"Help! Come quick and bring a bucket; our boat's sinking!"

"Just coming!" was the reply.

Just then a huge greenish-brown head, with a short, broad muzzle, and small eyes under a flat skull, rose out of the water beside the boat's prow.

The creature stared at the petrified explorers for a few moments, and then, opening its mouth, which was decorated with several rows of sharp teeth, it began climbing on to the boat, which sank still further into the water under its weight. A short, thick neck appeared, then part of a hairless body; the animal seized the side of the boat with the sharp claws of its front paws.

The explorers had not taken their guns when they went off to fetch the firewood near their camp, and so they now found themselves unarmed, face to face with a reptile they had never seen before but which without any doubt was fierce and very strong. Their axes had been left in the bow of the boat and were now in the water, beneath the enemy's paws.

"Quick, tie your knife to the butt-end of this oar," exclaimed Maksheyev, "and I'll try to hold off the brute with the other one."

With his knife between his teeth, he seized one of the oars and thrust its blade with all his strength into the monster's gaping mouth. The violent blow against its palate and tongue stunned it, and made it close its jaws. There was a cracking noise; sharp teeth broke up the wood and bit into the tin binding of the blade.

Maksheyev shoved the oar deep into the monster's maw, but



Maksheyev shoved the oar deep into the monster's maw.

the jaws had shortened it, as they chewed and spat forth fragments of wood stained with blood.

At last Gromeko, who had fastened his big hunting-knife to the butt of the other oar by his bootlaces, stood up behind Maksheyev and poked this improvised spear into the monster's eyes. Mad with pain, the creature bounded to one side, tore the oar out of Maksheyev's hands, and vanished into the water; the explorers caught sight of its broad, brownish-green back covered with a double row of scales and its short, thick tail, which flailed the water so violently that both men were drenched from head to foot.

The boat was torn away from the bank by the monster's commotion, and it now sank.

As this occurred, Kashtanov, hurrying on his way to help them, was still some distance away. As he rowed round the bend in the river he saw the spray thrown up by the monster, but he did not realise what had happened. The dead tree floated past him, violently rocked by the waves. He took it for a crocodile and was about to push it away with his boat-hook, but just then Gromeko, who did not want to lose his hard-won booty, shouted out:

"The log, grab the log! It's our firewood!"

Kashtanov grappled the tree with his boathook, fastened the tow-rope to it, then rowed to where his friends were standing up to their waists in the water.

With some effort, they hoisted up the boat, bailed out the water and returned with their spoil to the tent, where Papochkin was frenziedly beating off the mosquitoes, which General had escaped by getting into the water up to his ears.

They hauled the log ashore and chopped it up, and soon a fire was crackling cheerfully. The horse-tails they threw on to it gave off such pungent smoke that the mosquitoes vanished, and it brought tears to the eyes of Maksheyev and Gromeko as they dried themselves by the blaze.

When he had heard their account of the water-monster's attack, Kashtanov said:

"I think it must have been a lizard belonging to a group that disappeared from our planet in the tertiary period."

"Would it be an ichthyosaurus?" asked Maksheyev, remembering the lectures on palaeontology he had attended as a student of mining.

"I think not, judging by what you've told me. The ichthyosaurus was much bigger, had a different-shaped head, and lived earlier, in the jurassic period. Your friend is more like a small crocodile of the cretaceous period."

"No, you wouldn't have got rid of an ichthyosaurus¹ so easily," remarked Papochkin; "and as for the plesiosaurus, that had a neck much longer than your oar and would have pulled you straight into the water instead of climbing on to the boat."

"Let's hope we shall see those huge reptiles in due course," said Kashtanov. "As we have drifted down the river we have been meeting specimens of earlier types of fauna. We are now in the middle or even at the beginning of the cretaceous period."

"Yes," added Gromeko," both the animals and the plants are becoming more and more unlike those on the earth's surface. The changes have been so gradual that we haven't taken account of them at the time. But just think—everything around us is completely strange: all the deciduous trees have vanished, along with flowers and cereals; there's a predominance of cyperaceae and gymnosperms, and a lot of cryptogamic² plants have appeared."

"This subterranean realm has plenty of surprises for us and from now on we shall have to be more careful. We mustn't move without guns charged with explosive bullets."

"I think we should only have a short rest, while we cook and eat supper, then continue our journey till we reach a better place. We haven't enough wood to build a fire big enough to keep off beasts of prey," said Gromeko.

All agreed with this. They hauled the damaged boat ashore to dry and mend it, had their supper, slept for a couple of hours around the smoky fire, and then set off again down stream, taking the rest of the firewood with them. For another two hours the impenetrable thicket with its fringe of reeds and horse-tails

¹ Ichthyosauri—marine lizards of the jurassic and cretaceous periods with features of both fish and lizard (whence the name): their bodies were fish-like, being without necks, their heads drawn out into beak-like snouts, similar to those of dolphins: the long tail ended in a fin and there was a fin also along the back; front and rear extremities were in the form of fins; the body was covered with plain skin. Some species were as long as thirty feet.

² Cryptogamic plants have no real flowers, with stamens and carpels, but multiply by means of spores. They are typical of the most ancient periods of life on the earth, beginning with the Devonian. Examples of cryptogamic plants are ferns, horse-tails, lycopodia, moss and ordinary mushrooms.

continued on both sides. In calm places fish leapt from the water, escaping from pursuit. Behind the fish, the explorers occasionally caught sight of the repulsive, gaping mouth of a reptile, then eddies and widening circles showed that a bulky body was rapidly sinking into the depths. From time to time the dragonflies, which had been hovering carelessly, scattered in all directions to hide in the foliage and reeds from a large blue bird with an enormous beak, which appeared suddenly with a loud whirring of wings, snapping up unwary insects as it flew.

At last the green walls seemed to divide, the current slowed down and the river grew wider; it was changing into a lake, dotted with islands. One of these particularly attracted the explorers' attention. Half of it was covered with tall trees, and half was a large stretch of grass with just a few trees, some of them dead. The men hastened to moor their craft beside the clearing.

The piece of meadowland was covered with short but tough grass which proved to be a kind of lycopodium. The greensward was on the upper half of the island, and the breeze blew downstream. There was no shortage of fuel, so they decided to make several good, smoky fires along the edge of the thicket, so as to keep away the animals of the island and ensure peace for themselves.

When the fires were crackling, clouds of smoke drifted into the thicket, and small birds and insects began to fly out; some of these fell to the ground, enabling the zoologist to collect a number of unfamiliar species. Then a strange and terrifying creature ran out across the meadow; it was like a porcupine, but as large as an ox, and with quills a yard long.

Bristling and turning into a huge prickly ball, the animal rolled past the astonished explorers and disappeared among the reeds.

Then a creature like a beast of prey bounded out of the thicket. It was deep yellow with a cat-like head, a fairly long, thick tail, short legs and a blunt muzzle with fangs bared. It resembled a large river otter of about six feet long, but differed from the otter by its more prominent ears and its short mane. Though it showed no intention of attacking them but slunk along the edge of the thicket towards the water, it interested Kashtanov so much that he shot it down.

It was indeed a most interesting animal. Among its teeth there

were neither flat incisors nor sharply protuberant molars such as are found in carnivores of more recent times. All its teeth were more or less sharp and conical, like those of a reptile. The front teeth, in place of incisors, were a little smaller and flatter than the rest, while those on the sides were rather larger, but the creature's fangs, bigger than all the rest, stuck far out from both jaws, especially from the upper one.

"Here's an interesting example of a primitive mammal; it still has a reptile's teeth, but it already shows the differentiation which was to develop later on," said the geologist.

Nothing else emerged from the thicket so the explorers could at last take their long-deserved rest—each in turn keeping watch over the fires which preserved them from the stinging insects. Thanks to this arrangement they slept soundly.

The following day the terrain continued the same as it had been the previous evening. The river finally turned into a lake with many islands; there was hardly any current now and they had to row all the time. Dragon-flies and enormous horned beetles, some of them nearly a foot long, hovered over the river and the forest; there were butterflies, each of whose wings were the size of a man's hand. From time to time bluish-grey birds both large and small appeared. They were rather like herons but with much shorter legs, and had longer tails and shorter beaks in which small teeth were visible.

The explorers succeeded in shooting down one of these birds as it flew, and Kashtanov displayed this strange creature, a transitional form between lizards and birds, to his companions. It was the size and shape of a crane and was covered with bluish-grey feathers. Its long tail was composed not only of feathers, like a bird's, but also of a great number of vertebrae, that is to say, the structure of its tail was like a reptile's, but with feathers growing out of both sides. On its wings it had three long fingers with the same sort of claws as on its feet, so that it could climb about on trees and rocks, clinging to them by its front claws. From his examination of the creature Kashtanov concluded that it belonged to the *archaeopteryx* family but differed from the specimens found in the upper jurassic strata of Europe by its considerably greater size.

By the end of the day the bank had become quite flat: much of it was covered by marshes, thickly overgrown with horse-tails and ferns, with occasional groups of strange trees that had

adapted themselves to aquatic existence. These thickets gave shelter to various irritating insects, which fell upon the explorers whenever they attempted to stop by the green wall to collect specimens, and even followed them for a time when they set off again. Gnats an inch long, flies as big as bumble-bees, gadflies and horseflies more than an inch and a half long, contended in these winged onslaughts on the explorers, who were obliged to beat a humiliating retreat and became worried at the thought of having to spend the night amidst hordes of these tormentors.

They moved for several hours across this marshy area, rowing vigorously so as to get away from it as soon as possible. The animal life here seemed limited to the insects and primitive birds in the air, and the fishes and reptiles in the dark depths of the water which revealed themselves by splashings and whirlpools. It was clearly impossible for four-legged mammals to survive in such marshy undergrowth.

"What animal could endure the stings of these frightful bloodsuckers?" exclaimed Gromeko.

At last a fresh breeze came from the south and from time to time a sort of regular roaring sound could be heard. Maksheyev was the first to hear the roaring.

"There's a large open lake with clear shores ahead of us, or even a sea," he said.

"A sea?" said Papochkin, surprised. "Can there even be a sea in Plutonia?"

"If there are rivers—and we cannot doubt that there are—they must eventually fall into some sort of still water basin. Rivers can't go on flowing for ever."

"But can't rivers get lost in marshy lakes like these, or run dry in sands?"

"They can. But these quantities of water indicate that there may be an open basin of water and that this semi-overgrown lake which we're crossing is merely the threshold of a larger one."

XXV

THE SEA OF LIZARDS ·

THEY were all interested to discover how large this basin would be and whether it would set a limit to their journey into Plutonia, since they could not, of course, push out into a boundless sea in canvas boats.

Within an hour a dark-blue edge appeared at the end of the broad strip of river-lake with its hardly perceptible current. The river's mouth was near. They pulled harder on the oars and in another half-hour had reached the beginning of the lake or sea.

The vegetation on the banks of the river did not run down to the very edge of the sea but was separated from the water by a broad strip of sand. Evidently the breaking of the waves prevented it from taking root by the water itself.

The explorers prepared to spend the night on this sandy beach, fanned by sea breezes and free from troublesome insects.

When they had unloaded their things on to the shore and made a fire, they went down to the sea to see what the water in it was like. They wanted to know whether the sea was an enclosed basin with salt water, or a large lake with water running through it. Besides, they all wanted to bathe, as during the last few days, since they had discovered that there were large reptiles in the river, they had given up the idea of bathing.

They undressed quickly on the soft, sandy shore and paddled into the shallow water, which grew deeper very gradually and did not reach the waist till some fifteen paces out. The water proved to be distinctly salty, but not so much so as in the oceans on the earth; it was rather like the water of the Baltic Sea.

Refreshed by their bathe, the explorers began discussing the question of their further travels. The sea had its limits; they could make out the opposite shore on the southern horizon even with the naked eye, and a good pair of binoculars quite distinctly revealed the green wall of undergrowth with some taller groups of trees, and occasional dark, purplish masses which were probably rocks and cliffs. Beyond the green wall, owing to the concavity of the surface, they could also see,

though less clearly, an unbroken stretch of the same lilac colour, with occasional groups of higher hills. This landscape made them long to cross to the southern shore. Nor was this impossible; it could not be more than twenty-five or thirty miles away, and on a calm day, with a light breeze allowing them to sail, they would be able to make the voyage without danger.

Owing to the lack of game in the zone of marshes and lakes, their stock of meat was exhausted, and all they had for supper was porridge. But Maksheyev and Papochkin began fishing. While bathing they had caught sight of a big fish, so now they took their rods and went up along the bank to where the river emerged from the undergrowth and the water was deeper. Their floats remained motionless for some time, and they were thinking of moving to another place, when suddenly a fish began tugging.

Maksheyev hooked a big fish and flung it on to the bank, but Papochkin's proved so heavy that it seemed likely to break his line; he began to draw his fish towards the bank so as to put his net over it. Then suddenly the water swelled up in a bubble, the rod gave a jerk, and a dark mass carried away both the fish and the hook; the fisherman only caught a glimpse of a scaly back and a short tail.

Maksheyev, who was busy taking his fish off the hook, heard the splash and shouted:

"Why, Semyon Semyonovich, the fish you've caught must weigh more than twenty pounds!"

"Not twenty, two hundred!" answered the terrified zoologist. "It's broken my rod and got away."

Maksheyev hastened up to his companion, bringing the fish he had caught to show him. It was a very strange creature, broad and flat like a plaice, covered with coarse scales of about half an inch square, with a tail in one layer, eyes on one side of the body and long spikes along the back-bone.

"Can we eat this monster?" he asked dubiously.

"Of course we can, it's like a plaice, though with some differences. I think it's a skate. In general you can eat any fresh-water fish—the only poisonous parts are, in some kinds, the roe, the milt or the black pellicle lining the abdominal cavity. If you take out all the innards you can even eat a fish of an unknown species—at the worst, the flesh may taste nasty or be too full of bones."

"In that case, let's try to catch some more. But what sort of fish was the one that got away from you?"

"I don't think it was a fish at all but a large reptile which grabbed my fish and swallowed it along with the hook and a piece of line."

"Oho, so those horrors exist here, too! And there we were, bathing in the sea without a care in the world!"

"Yes, we must be more careful. After all, in the seas of the jurassic age (and what lies before us is evidently a sea) there were enormous ichthyosauri, plesiosauri and other fierce lizards that could easily bite a man in half."

"Were there sharks in those days?"

"Yes, sharks too. They existed almost as far back as the devonian period, and attained a tremendous size. Teeth of theirs have been found twenty-eight inches long. Just imagine the mouth that could contain such teeth!"

The fishermen tried again and soon caught some big fish, resembling the sterlet of today. These they cleaned and put on the fire to make soup. While this was cooking the fishermen caught another dozen or so similar inhabitants of the deep.

After supper they sat beside the tent smoking their pipes and discussing their forthcoming voyage; the sea which they were to cross splashed gently on the near-by sand, strewn with the shells of various molluscs that were of great interest to the geologist.

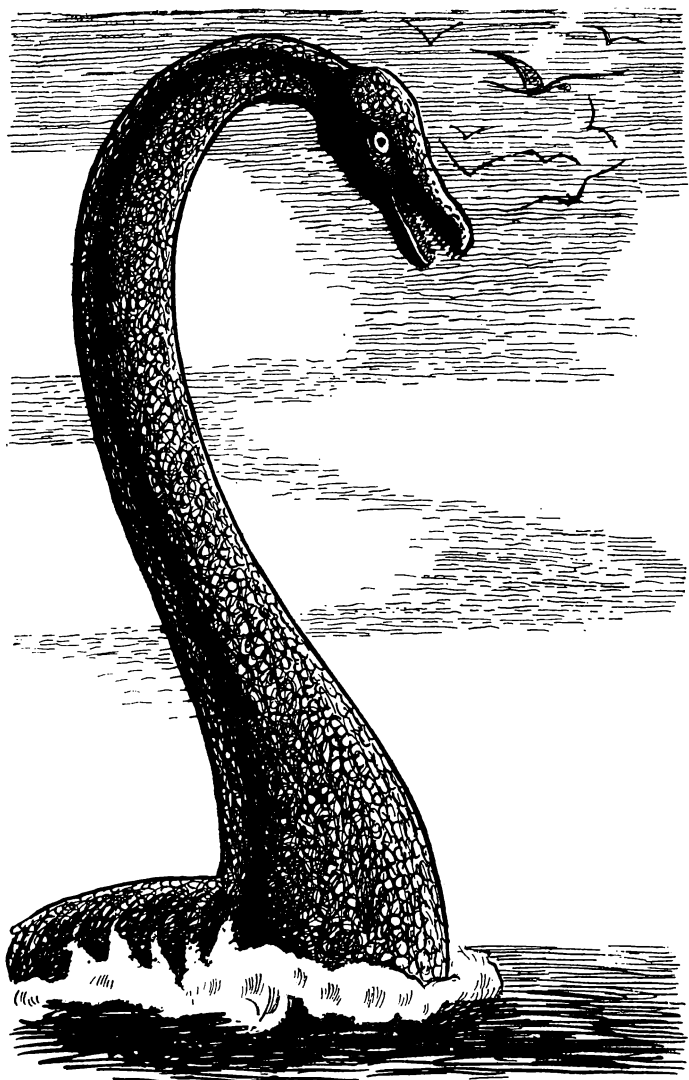
While his companions were catching fish he had collected many shells, which he classed as ammonites.¹

"Look!" Gromeko's sudden shout interrupted their conversation. "What huge sea-serpents!"

Not more than a hundred yards from the shore two heads rose up from the sea, each supported by a long neck; they were flat like snakes' heads, and the necks writhed gracefully. They might have been two enormous black swans, their bodies hardly showing above the water.

"They're not snakes," said Kashtanov, as he gazed at the creatures through his field-glasses. "I'm sure they are nothing

¹ Ammonites—division of extinct cephalopodic molluscs with many-chambered, spirally-rolled shells. The mollusc occupied only the front chamber of its shell, as in the case of the nautilus of our time. There were especially numerous kinds and species of ammonites in the triassic, jurassic and cretaceous periods.



“I’m sure they are nothing more nor less than plesiosauri.”

more nor less than plesiosaurs,¹ which is quite possible in a sea of the upper jurassic period."

"What monsters!" said Papochkin, also watching the creatures through binoculars. "Their necks must be quite six feet long."

"And won't they come and visit us?" asked Gromeko, who still remembered his adventure with the reptile in the boat.

"Who knows? But I think they are very clumsy when they get on dry land, so we can easily escape from them. In any case, let's load our guns with explosive bullets."

But the sea monsters showed no desire to come on land; they began diving, in pursuit of fish. Swimming slowly alongside the shore, they spied their quarry ahead of them, seized it with a swift movement of the neck and head, tossed it into the air and caught it by the head so as to swallow the fish with the scales and prickles facing away from them. Their movements were very swift and graceful. Sometimes their prey escaped them, and then the creatures leapt up almost out of the water in pursuit, cleaving the waves noisily and stretching out their necks.

The fishing of the plesiosaurs, which the explorers followed with great interest, ended in a squabble. The two creatures seized the same fish, presumably a fairly large one, both at once, and each tried to wrest it from the other's mouth.

One of them was successful and rushed off headlong; the second followed and, overtaking it, seized its adversary's neck to make it release the fish. The entangled necks writhed this way and that, the dark bodies bumped against one another, the short tails and fin-flippers frenziedly beat the water, sending up fountains. At last one of the plesiosaurs, enraged, let go of the fish, sank its teeth in its rival's neck and dragged it down into the depths. The water above the spot was troubled long after the monsters had disappeared.

An hour later, Gromeko and Kashtanov, collecting fragments of trees cast up on the shore by the waves, to serve as firewood for the night, saw a dark mass floating on the water. It was borne along beside the shore, gradually getting nearer and at last stopping, probably caught on a sandbank.

On their return to the tent with their firewood, they found their two companions already asleep; they unfastened one of

¹ Plesiosaurs—marine lizards of the jurassic and cretaceous periods with massive bodies covered with bare skin, long, swanlike necks, tiny heads and two pairs of fin-like extremities; nine to fifteen feet in length.

the boats and rowed out to where the dark mass lay. It turned out to be the carcass of one of the plesiosaurs. Some large birds were already sitting on it and pecking at it; other, smaller birds, were circling in the air above, evidently awaiting their turn to partake of the feast and uttering sounds like frogs croaking. Their flight was like that of bats.

The explorers had to disperse the flock of birds with a few shots before they could get near the carcass. Its head and the upper part of its neck were hanging by shreds of skin, torn away by the teeth of its rival. The dead creature floated belly upward, its great fin-flippers sticking out of the water. The belly was covered with bare brownish-green skin.

It was impossible to drag the plesiosaurus on shore. Its body was more than six feet long, its tail a little less and its neck even more; its rear fins were nearly four and a half feet long. The birds they had shot down proved to be flying lizards¹ of two kinds: the big ones were larger than eagles, the smaller ones as big as large ducks. Both kinds had large heads and beaks equipped with teeth; their bodies were bare and membranes connected their front and back legs, as with bats. The little ones had long tails.

XXVI

CROSSING THE SEA

THE weather next day turned out to be favourable for a sea-voyage. The sky was almost cloudless, a slight north wind was blowing, sufficient to allow them to use sail, while not raising large waves. In preparation for the voyage they thoroughly examined the boats and raft and hoisted their tent as a sail

¹ Pterodactyls, or flying lizards—extinct reptiles of the jurassic and cretaceous periods. They had large jaws with conical teeth, and a long neck, and some had a long tail. The front and rear extremities were joined by a membrane, so that these lizards could fly like bats. Pterodactyls were of various sizes—from the size of a mouse to huge ones three feet long and with a wing span of eighteen feet.

between two boat hooks which served as masts. Maksheyev piled up a pyramid of driftwood on the shore, and on it they erected a pole with a white flag to serve as a landmark for the return voyage. A little further from the shore, on the edge of the thicket, at a spot which the surf could reach only in exceptional cases, they dug a pit in the sand; here they hid their collections of specimens—rocks, herbaria, animals' skulls, bones and skins—to avoid getting them wet on the voyage, and so as not to carry unnecessary weight. Over the covered-in pit they erected another pyramid of driftwood to prevent wild animals, attracted by the smell of the skins, from digging it up. They fastened a bottle to the top of the pyramid, containing a brief description of the expedition's route from the tent at the edge of the tundra to the sea-shore.

These tasks completed, the explorers settled into their boat and began their voyage, setting a course due south, towards the opposite shore, which was just visible on the horizon. Some way out from the shore, the wind filled the sails of the vessel, and movement became speedier.

At this distance from the northern shore of the sea the explorers were able to get a better idea of its general character. On both east and west of the mouth of the Maksheyev River, the shore was fringed by the same high green wall, broken in a few places by similar estuaries. The pyramid, topped by the flag, stood out clearly against the green background. Neither mountains nor hillocks were visible behind the strip of undergrowth, and it was evident that the terrain on that side of the sea, for a considerable distance inland, was a low-lying plain, probably covered with forest and marsh.

After navigating for two hours they had a rest, letting their vessel continue under sail alone.

The sea was calm. A light breeze scarcely rippled its surface, which at this distance from the shore was quite deserted. The water was very deep, a weighted line of a hundred yards long failing to touch bottom; the explorers had no other means of measurement. When they had rested, they took up their oars again and rowed for another hour.

They now found themselves approximately in the middle of the sea, both shores seeming equally distant. Soon the wind freshened a little and they moved faster. They were already able to make out tall cliffs—black, lilac, or reddish—rising in tiers back into

the hinterland. These cliffs stretched along the very edge of the shore, giving way on the right to a green wall of forest; this in its turn was succeeded, further to the right, by a line of high, reddish hillocks, which at some points came down to the edge of the water and at others was separated from it by a narrow strip of green.

As they drew near the shore the sea began to show signs of life. Huge jellyfish of a yard in diameter appeared, rocking their transparent bodies on the waves; when the men stopped rowing they could see shoals of fish of all sizes in the water beneath them. From time to time nautilus appeared, displaying their sails and their red tentacles above shells as white as snow.

About a mile from the shore the marine population grew denser. In places the seaweed formed whole floating islands, and the oarsmen made slow headway; the oars tended to stick among these soft green masses and lifted small cockleshells, fish and insects out of the sea, along with stems of seaweed.

The rowers cast their improvised plummet and found the depth to be about seventy-five feet. From where they were now they could clearly see a white strip of surf at the foot of the cliffs.

Up to now the voyage had gone as uneventfully as a pleasure cruise. But fate held some anxious moments in store for the explorers. Approximately half a mile from the shore the head of a plesiosaurus suddenly reared up out of the sea, some thirty yards from the vessel and, gracefully swaying on its long neck, advanced towards them. The lizard swam slowly, keeping its eye on the men, whom it evidently took, together with their craft, for some large, unfamiliar beast.

The guns, loaded with explosive bullets were ready, and as soon as the plesiosaurus was near enough, two reports rang out.

Both bullets found their target. The graceful neck shuddered and blood spouted from the half-open mouth. The head dangled helplessly from the shattered neck, and the creature began thrashing the water, throwing up such waves that the voyagers had to row away fast for fear of being overwhelmed by them.

They were pulling hard for the shore when a dark bulk tore past them, raising two ridges of waves, just like a submarine; a greenish-brown back and a very long head, like a crocodile's, emerged from the water. The monster, half-opening its mouth,

set with sharp teeth, rushed towards the dying plesiosaurus, evidently counting on easy booty.

"I do believe it's an ichthyosaurus!" exclaimed Kashtanov, as he watched the fearful reptile.

"Well, this one is even worse than the other," remarked Maksheyev. "He could easily grab a man and bite him in half."

"And it wouldn't be easy to sight and shoot him in the water," said Gromeko.

The shore was not far off now; before reaching it the explorers caught sight of a young ichthyosaurus chasing fish; in their flight, the latter leapt out of the water just like gudgeon or minnows pursued by a voracious pike; the mouth of the ichthyosaurus was very similar to that of a pike.

Avoiding the breakers at the foot of the cliffs, the explorers rowed towards a low stretch of shore fringed with vegetation; here they could see a level, sandy patch suitable for their camp. But the sea was so shallow near the shore that they had to wade out of the water and drag the boats and the raft up to the land. The crossing had taken six hours and it was now midday. After lunch and a siesta they would still have time to stroll around. After beaching the raft and boats they pitched their tent and began cooking their meal. In doing so they noticed that their stock of fresh water was coming to an end.

"We've been very careless," said Papochkin. "Who knows whether there's any fresh water over here? We should have brought enough with us for several days."

"If we don't find any water we'll have to sail back without seeing hardly anything on this side," said Gromeko.

"I think you are worrying unnecessarily," Kashtanov reassured them. "If there were no vegetation on the shore it would be a different matter. In that case we would, of course, have brought fresh water with us; had it looked like a desert the landscape would have warned us to do that."

"I'm sure we'll find either a brook or a spring somewhere near," said Maksheyev. "This lush vegetation couldn't survive on salt water."

After lunch and a siesta the zoologist and the botanist went into the forest in search of water, while Kashtanov and Maksheyev explored the cliffs to the east of the landing-place.

They all took guns loaded with explosive bullets in case they should meet land lizards or other beasts of prey. They left

General tethered by the tent, near a big fire which they made to keep off unwelcome visitors.

XXVII

MAKSHEYEV'S TREASURE-TROVE

THE nearest cliffs were almost black, with red and yellow spots and streaks. They turned out to consist of iron ore—solid magnetic ironstone. Every blow of the geologist's hammer revealed this ore, with pockets and sprinklings of some other dark rock in only a few places.

"What a lot of wasted wealth!" exclaimed Maksheyev, when they had examined a series of cliffs all containing the same ore, slightly weathered and oxidised on the surface.

"Yes, you could dig a mine here that would supply ore for the population of the whole world," said Kashtanov. "Though, of course, you'd first have to lay a railway across Plutonia and Nansen Land and instal giant icebreakers in the Beaufort Sea."

"That's something for the future, and not too far distant either. When reserves of iron ore start getting short up there, even undertakings like that may be profitable for mankind."

About half a mile from where the cliffs began, the waves beat against the foot of the sheer rocks, and barred the way, preventing further inspection of the shore.

"We'll have to carry out investigations by boat in calmer weather," said Maksheyev.

"Meanwhile, suppose we try to get up to the top by one of the ravines we passed?" suggested Kashtanov.

They turned back a little way and delved into the first of the fissures which split the face of the cliff. Its entrance was packed with large blocks of ore over which they clambered with considerable difficulty.

In the middle of these acrobatics, Maksheyev suddenly stopped in amazement.

"Look, what's that?" he exclaimed, pointing to a gleaming,

bright yellow vein, between two and four inches wide, intersecting a huge lump of magnetic ironstone. "I'll bet you anything you like that's pure gold!"

"You're absolutely right," replied Kashtanov. "It's pure gold, and high quality, too."

"What a waste of riches," the former gold-pro prospector exclaimed. "I've seen a good many deposits of gold in my time, in California and in Alaska, but I've never come upon a vein of solid gold like this before, nor even heard of such a thing."

"I have never read of such veins either," said Kashtanov. "But after all it's only in a lump of rock, not in the cliff itself, so the gold in it can't weigh more than a few score pounds."

"Since there's a vein in this lump there must surely be more in the whole cliff."

"There may be, of course. We can look, but the vein may come out on an inaccessible cliff-face, and we shall be left to look at it from afar like the fox at the grapes."

"There are no cliffs inaccessible to dynamite and mining operations," cried Maksheyev, excitedly. "Just let's find it!"

"I think that the interest of this find will be purely theoretical for us. We can't take a ton of gold away in our little boats, nor even a couple of hundredweight."

"Never mind! Let's take as much as we can, and later we'll send a special expedition into the depths of the earth to get the rest."

After examining the cliffs which overhung the pile of rocks at the mouth of the ravine, and convincing themselves that there was no gold there, the geologists climbed up the ravine which became wider a little higher up. Its sides rose sheer, its bottom was strewn with broken rock and debris. The sides contained only magnetic ironstone, but Kashtanov noticed some other kinds of rock amid the fragments lying on the bottom.

"There's some more gold for you!" said Maksheyev, who had climbed some fifty paces up the fissure. He lifted a fragment of ore scattered with tiny specks of gold.

About two hundred paces from the mouth of the ravine the bottom sloped sharply upward, then became a series of ledges. When they had surmounted the first of these, the geologists halted in front of a perpendicular face of rock, about twelve feet high; this was an insurmountable barrier, as it was impossible to scramble up the smooth front of the rock.

Maksheyev rapped his hammer against the cliff face in vexation and exclaimed:

"We can't get any farther. That's the end of our hopes of finding a gold vein!"

"Yes, we'll have to look for another ravine."

"Why, what's this?" said Maksheyev angrily. "Instead of giving us that gold, the cliff wants to take my only hammer away."

His outburst was caused by the fact that the hammer had stuck to the rock and he was trying vainly to pull it off.

Just then Kashtanov, who was examining a piece of the rock, turned his back, with the gun slung across it, to the cliff face, and felt some mighty force dragging him towards it. The gun clanged against the wall, and the geologist found he had not the strength to tear it away.

"What powerful magnetism!" he exclaimed. "The magnetic ironstone has grabbed both your hammer and my gun!"

"But how are we going to get them back? We can't leave such essential things here in eternal memory of our unlucky expedition!"

Kashtanov got his shoulder out of the sling, but the gun stayed firmly fixed against the rock. Maksheyev, seizing the hammer with both hands, pulled at it with all his might and at last succeeded in tearing it off. Then they joined forces to pull at the gun and managed to get this away too.

"There's nothing for it, we must go back," said Kashtanov. "With anything iron on us we'll only tire ourselves out."

"Stop, I've thought of a way of climbing up. Let's leave our guns here: there can't be any animals in this barren gorge."

"And then?"

"Just watch!"

Maksheyev chose some large angular pieces of ore from among the debris on the ground and placed them, flat side on, against the sheer wall of the ledge; they stuck to it at once and held firm. The pieces of ore thus affixed to the magnetic surface formed a flight of steps by which, with a certain amount of risk, they could climb up.

"How resourceful you are!" said Kashtanov. "You're a true gold-pro prospector, overcoming every difficulty successfully."

"Thanks for the compliment. I got the idea from my hammer. When it stuck to the wall and I pressed on it and it didn't budge,

I thought to myself 'there's the rung of a ladder for you.' The rest was obvious."

Leaving their guns and bandoliers and the bag with specimens of ore, the geologists climbed on up. Maksheyev went first, continuing the stairs with pieces of ore which his friend handed up to him from below. Within five minutes both were at the top of the cliff.

The ravine was the same above as below—sheer walls to right and left, a series of ledges in front, and solid, magnetic ore everywhere. After clambering another two hundred feet or so, the geologists came upon a lump, about the size of a bull's head, of bright yellow metal—solid gold.

"Well, gold-seeker, what about taking that little nugget back to camp!" laughed Kashtanov.

"Yes, it's a decent lump," answered Maksheyev, kicking the block of gold, which did not budge. "I reckon it must weigh a couple of hundredweight and be worth about 100,000 roubles. The vein of gold can't be far off!"

They both began closely examining the steep sides of the ravine and soon perceived, on their right, about twelve feet up, a yellow vein of gold running obliquely across the dark ironstone; in places it was a foot and a half wide, while elsewhere it narrowed, sending out ramifications above and below.

"Millions, millions before our very eyes," gasped Maksheyev, taking in at a glance the whole length of the vein. "Dozens of tons of gold!"

"You're too keen on the gold," remarked Kashtanov. "Even if this vein is worth tens of millions, after all, it's only a vein; but the mountain of iron ore round it contains millions of tons, worth millions of roubles."

"But it's quite likely that this isn't the only vein; maybe whole sections of the mountain are made of gold; if so, its stock of gold is worth millions of roubles too."

"If we managed to dig out such masses of gold, its market value would fall in no time. Gold is only costly because it's rare. And gold is much less important for mankind than iron, without which modern technique would not be practicable. If you were to do away with gold currency and useless gold ornaments the demand for gold would be very small."

"You exaggerate the importance of iron," Maksheyev objected. "If gold were plentiful, it could replace other metals,

especially in alloys with copper, zinc and tin. We could make bronze from cheap gold, and wire too, and many other things for which now we have to use copper and copper alloys."

"All the same, there are huge masses of iron here, without any doubt, while the amounts of gold are problematical, and relatively small."

"Very well, then, you take your iron and leave the gold to me when we come back here to work the ore," laughed Maksheyev.

"I can leave you the iron ore as well; let these millions or milliards be your spoil!" Kashtanov replied with a smile.

On their way back to the seashore the explorers noticed several similar ravines. In every case the walls were made of iron ore, with veins and pockets of gold here and there. But they found no more thick veins like those they had discovered in the first ravine, and Maksheyev had to admit that the wealth represented by the iron ore was incomparably greater than that of the gold. Heavily loaded with specimens of the priceless ore, the geologists at last got back to the tent where their friends, who had returned a little earlier, heard their story with astonishment.

XXVIII

THE FOREST OF HORSE-TAILS

THE beach of sand and shingle was fringed with dense vegetation; huge horse-tails, twenty-five to thirty feet high, stood in serried ranks. Their green branches began so near the ground that it was only possible to get through by crawling or stooping very low. Tree-ferns of various kinds grew among the horse-tails and the whole formed an almost impenetrable thicket.

Papochkin and Gromeko, searching for a track or a natural break in the thicket, at last found a narrow, dried-up gully between the cliffs and the forest. Not far from the sea this gully divided: one branch ran to the left between the rocks and the

forest, while the other led into the depths of the thicket. The vegetation was somewhat different here: besides horse-tails and ferns there were palms, sago and others, which overtopped the horse-tails by many feet. The ground of the forest was covered with short, tough, bristly grass. Other plants grew along the bank of the gully, at the edge of the forest. Gromeko called out the names of these plants, getting more and more excited.

"Do you realise," he exclaimed at last, "what geological period we are in now?"

"Not the carboniferous, by any chance?" growled the zoologist, who could find hardly anything in his own line in this forest, and only pricked his hands on the thorny grass.

"Come, that's going too far. Were there ichthyosauri and plesiosauri in the carboniferous age? Thanks to the geologists we're already clear about that. No, old man, we're in the jurassic period now. Look, here's the typical fern of that time; here's the graceful ginkgo tree; and this tough grass was first found in the jurassic deposits of Irkutsk Province, on the banks of the River Angara, and called after its discoverer, the geologist, Chekanovsky."

"Was it really worth calling it after him? It's worse than our stinging-nettles, and no creature but a reptile with a tin throat could eat such stuff."

"Talk of the devil!" said Gromeko, interrupting his angry companion. "Just look at this little footprint—this is more in your line."

He stood still in the middle of the stream-bed, pointing at the ground. Prints of huge three-toed paws, with blunt claws, were deeply sunk in the fine sand. Each print was over a foot long.

"Well, that's some monster!" exclaimed the zoologist with a slight tremor in his voice. "It must be a lizard of some kind. But it would be interesting to know whether it's herbivorous or carnivorous. If it's the latter, it might not be too pleasant to meet."

Papochkin examined the footprints closely; they disappeared where the sand gave place to shingle.

"It's odd that all the prints are the same size," said Gromeko. "As far as I know, forepaws are always smaller than hindpaws, And what's this depression between the tracks of the right and

left feet? It's as though the creature were dragging a huge log after it."

Papochkin laughed.

"That's the track of the lizard's tail. Judging by its size and by the identical footprints, I should say the creature was walking on its hind legs only and leaning on its tail."

"Were there ever two-legged lizards?"

"Yes; they belonged to the jurassic period. The iguanodon, for instance, which was like a huge kangaroo, with enormous hind legs and small front ones."

"And what did it eat?"

"Plants, going by the shape of its teeth. If these tracks really belong to an iguanodon, we've nothing to be afraid of, even though this monster reached a length of fifteen to thirty feet in the jurassic period."

"Well, that's fine," sighed the botanist. "I can't forget that repulsive reptile who was going to make a meal of us that time on the river."

The explorers decided to follow the right branch of the gully, running along the foot of the cliff, where they were more likely to find a spring, the main object of their expedition. And higher up they found the soil did actually get damper and damper, and the vegetation alongside it lusher and more varied.

Soon water glistened in the gully between the stalks of the vegetation.

"We're saved!" cried Papochkin. "A spring, and not far from our camp."

"But suppose it's salt water?" said Gromeko, teasingly.

"Taste it. It looks fresh."

"How can you tell by looking at it? I'm sure I can't."

"You a botanist and you don't know what plants grow near salt water?"

"In the first place, this is the jurassic period and we don't know yet what plants grew around jurassic salt water. Secondly, you said you could tell what sort of water it was by the look of it, not by the look of the plants near it."

"I didn't express myself properly. I ought to have said: by the look of the gully the water's fresh. If the spring were salt water, the whole bed would be covered with a deposit of salts of various kinds."

While talking, Papochkin and Gromeko walked rapidly up

the watercourse, which soon turned into a fissure in the tall rocks, where a little brook of fresh water trickled out and was gradually lost in the sand.

They could see a great many footprints, both large and small, left by lizards that had been there to drink.

"What a lot of them!" exclaimed Gromeko. "It looks as if we should be meeting one of those two-legged monsters."

When they had slaked their thirst, the explorers cautiously pushed on through the crack in the rock, up the course of the brook, keeping their guns ready in case of emergency. The crack widened out into a depression between almost perpendicular crimson rocks; this hollow was pleasantly shaded by the greenery of the bushes and trees which grew along the foot of these rocks. A tiny lake glistened in the middle of the emerald grass of the hollow, and springs bubbled forth, from out of the bottom of the lake, which was just visible through the transparent water. A broad, well-trodden path led across the grass to the edge of the lake.

When they had filled their tins with water, the explorers hid in the bushes at the edge of the hollow, in wait for some animal to come and drink. But the minutes passed and nothing appeared. Only a few dragon-flies, even larger than those of the Maksheyev River, hovered in the air above them. Papochkin, who was watching them, suddenly seized his gun.

"What's up now? Surely you're not going to use explosive bullets against dragonflies?" laughed Gromeko.

"Shsh, look over there, on that rock!" whispered the zoologist, pointing to the cliffs which rose above the entrance to the hollow.

In a little clearing a small dinosaurian reptile was standing on its hind legs supported by its long, thick tail; it was very like a kangaroo, dark green, with brown spots, but its head was like that of a tapir, with an overhanging upper lip, shaped like a trunk.

"I do believe it's an iguanodon!" whispered Papochkin.

"What a pity it isn't a kangaroo," remarked the botanist. "We could have eaten a kangaroo for supper, but we'd hardly dare eat a lizard."

"My dear chap, don't forget we're in the jurassic period and we shan't find any birds or mammals to eat. If we don't want to die of hunger we'll just have to get used to eating lizard meat.

In spite of your botanical enthusiasm you haven't found us any edible roots or fruits or grasses yet. Don't ask us to live on horse-tails or that vile Chekanovsky grass!"

"What about fish? After all, the sea's full of them."

"Why do you not mind eating fish and yet object to eating the flesh of a herbivorous lizard? It's nothing but prejudice, which you'll have to give up in this subterranean world."

There was a shot. The creature jumped into the air and crashed heavily down on the grass. When it had stopped kicking the explorers came out of their hiding place and approached it.

The young reptile was taller than a man. Its clumsy body was supported by long, thick hind legs and a thick tail which ended in a point. Its forelegs were short and slender and had five toes each, with small, sharp claws, whereas the hind legs had three toes with claws which, though large, were blunt. The whole set of its body showed that the creature liked a vertical position, since when it was in a horizontal position its rear was a good deal higher than its front half. The head was large and somewhat repulsive, with drooping fleshy lips and tiny eyes. Its body was completely bare, like that of a frog, and the skin slippery and cold to the touch.

"Not very appetising!" exclaimed Gromeko, kicking one of the lizard's thick haunches. "Something like an enormous frog!"

"If the French eat fricassee of frog and enjoy it, why shouldn't Russian explorers have a crack at iguanodon steak? But let's write a description of it, first, then cut it up."

When they had measured, photographed and written notes on the lizard, the explorers cut off its fleshy hind legs, each of which weighed over two stone, and returned to the camp, heavily loaded with food and water.

The lizard meat, fried in slices in the pan, turned out to be so savoury and tender that even Gromeko, who had an aversion to all reptiles and amphibians, ate it with enjoyment.

After supper they considered their plans for pushing on further. They could no longer go on in the boats which had served them so well up to now, unless they found a river from the south flowing into the sea; in this case they could row. So their first task must be to seek the mouth of such a river.

While looking for this they must also examine the terrain along the coast, and decide on the route they would take should

they find no river. In that event they would have to proceed on foot, which would, of course, greatly restrict the range of their travelling.

XXIX

CARNIVOROUS AND HERBIVOROUS LIZARDS

NEXT day a fairly strong wind blew, raising a regular swell on the sea, and spray from the breakers even reached the tent. It was impossible to set sail in their fragile vessel in such weather, and the explorers decided to set out all together into the interior of the unknown land, following the gully through the forest.

As it was improbable that marine reptiles would attack an empty tent, they left General alone beside it, but not tethered, so that if necessary he could take refuge in the woods.

On both sides of the left-hand branch of the gully the explorers had followed there was an unbroken wall of horse-tails and ferns. Here and there the narrow tracks of small animals, wound their way through the thickets. Enormous dragon-flies and other large insects hovered in the air above the tops of the trees; occasionally small pterodactyls would swoop down in pursuit of these insects. But the heart of the forest seemed quite dead and uninhabited; no bird's song was to be heard, nor the rustlings which had been so common along the banks of the Maksheyev River. On just one occasion, Gromeko, walking in front, noticed a dark animal the size of a small dog in the narrow path, but this creature vanished so quickly that he had not time even to aim at it. They had to be content with catching insects; Papochkin captured a butterfly with a fourteen-inch wing-span, as it settled on the flowers of a palm-tree, and a few beetles, as big as a large fist, whose bites and scratches were very painful.

At last the forest came to an end and the explorers emerged into an extensive clearing, covered with the same harsh grass,

and where the soil was damp, with lycopodium, moss and small bushes of creeping fern. To the south the clearing reached to the steep, barren slopes of some purple hills about six hundred feet high and intersected by a deep ravine; it was most likely from there that the water which kept the clearing marshy, flowed, and which when there was rain, ran down the ravine to the sea. The clearing was about three-quarters of a mile long and between a hundred and two hundred yards wide.

The geologists were attracted by the crack in the mountainside, and they headed towards it. But they had not gone far when they noticed, on the northern edge of the clearing, a small herd of lizards feeding near a projecting part of the forest.

Some of the creatures, standing on their hind legs, were tearing off the leaves of palm trees and young tender shoots of horse-tail and fern with their thick lips. Others, very young ones, were eating grass, grotesquely lifting their thick hind-quarters in the air and wagging their tails. Sometimes they would play together and chase each other, bounding about clumsily, now on all fours, now on two legs.

The explorers could not miss such an opportunity to photograph iguanodons grazing and at play. The men quickly went back to the edge of the forest and began creeping along it towards the herd. They had managed to get quite near and take one photograph when the iguanodons suddenly showed alarm; the adults stopped eating, became alert and uttered a shrill whistling sound. On hearing this, the young ones got on their hind legs and, waddled clumsily towards their parents, who formed a ring around them, their backs turned outwards.

A second and a third photograph recorded the iguanodons' alarm, which proved to be not without cause. From the other end of the clearing a monster, which the explorers at first took for another iguanodon, was approaching along the edge of the forest with tremendous jumps, each of several yards' length.

It was of the same height as the iguanodons and, like them, used only its hind legs; but as it drew near they saw that it was much less clumsy and its movements were incomparably quicker. Jumping up to the circle of iguanodons, the monster halted and uttered a loud hissing noise, to which its opponents replied with a long-drawn-out, doleful whistling. Then it began circling round the lizards with short leaps, only to find their lifted hindquarters and heavy, waving tails at every turn. One



The monster halted and uttered a loud hissing noise.

of these tails or one of the massive hind legs could probably deliver a blow of terrific force.

Seeing that it was impossible to break through the ring and seize one of the young ones, the animal suddenly took a tremendous leap over the heads of the defenders and crashed down on the young iguanodons as they huddled together in the centre. The cowardly herbivores scattered in all directions, fleeing from the foe, who succeeded in seizing one of the youngsters and at once biting through its throat.

The explorers photographed the various phases of the attack; then two reports rang out and the beast of prey fell to the ground beside its victim. When it had stopped kicking the explorers were able to examine this new specimen of the large reptiles.

It really was like the iguanodons, with its long hind legs and thick tail serving as a support for the body. Its forelegs were very short and each ended in four toes with sharp claws. It had a short neck, and a small head with a huge mouth, set with sharp teeth, and at the top end of its nose was a short, flat horn, more of an ornament than a weapon of attack.

Two small horns stuck up above the creature's eyes, and a row of small, sharp spikes extended from head to tail along its backbone. The bare, wrinkled skin was greenish-grey in colour. The animal was some fifteen feet long and undoubtedly possessed tremendous strength, while its attack on the iguanodons testified to its agility and boldness.

After examining the dead lizard, Kashtanov declared that it must be a ceratosaurus, belonging to the same division of the dinosaur family as the iguanodons and other land lizards of the mesozoic era.

"I hope we're not going to eat this revolting creature!" said Gromeko, when they had finished measuring and writing a description of it.

"Why not? If we had no other meat, we'd have to be satisfied with this," replied Maksheyev. "But as it is, we can take advantage of the iguanodon which the monster has killed."

"We must hide it well, though. Otherwise the pterodactyls won't leave us a scrap. Look, they've smelt their prey already!"

And in fact some flying lizards were already circling over the clearing, croaking hoarsely. So the explorers cut the hind legs off the young iguanodon and hid them in the thicket, hung from the boughs of a tree; then they moved off towards the ravine

across the clearing, which was quite deserted after the battle and the shooting.

XXX

THE RAVINE OF THE PTERODACTYLS

THE mouth of the ravine was wide, and a brook wound its way down the bottom, fringed with patches of fern. The steep slopes were devoid of vegetation—they were bare and rocky, and either reddish, black or yellow in colour. Kashtanov and Maksheyev hastened towards the rocks. Gromeko began hunting for new plants along the banks of the brook, while Papochkin chased some enormous butterflies.

The first cliff which the geologists approached was dark red. Kashtanov was expecting it to consist of iron ore again, but after chipping a piece off and studying it through his magnifying glass he shook his head and muttered:

“This is something new!”

A number of small pieces chipped off from other places were of the same kind, but the rocks were too hard and smooth for him to be able to obtain a larger specimen. Then the geologists, joining forces, began bashing a lump of the same rock which was lying at the foot of the cliff. At last it cracked and split into two parts; veins and pockets of some white metal gleamed in the middle of it.

Kashtanov exclaimed in amazement:

“It’s virgin silver, apparently, in solid red silver-ore.”

“Untold wealth again!” laughed Maksheyev.

After their discovery of the vein of solid gold, the importance of which had been treated so slightly by his learned friend, Maksheyev’s attitude to the mineral gifts of this wonderful country had become a little scornful.

Proceeding further along the foot of the cliff, the geologists soon reached a place where the dark red colour gave place to black with yellow and red patches and veins. Here they found

solid magnetic ironstone again. A little farther on, deeply-worn and scooped-out hollows in the cliff showed bright yellow and yellowish green. Kashtanov recognised lead ochre and oxidised lead ore, which might contain a massive deposit of lead.

Still further up the ravine arose a high rock which attracted their attention by its dark green colour; from a distance it seemed to be covered with moss or lichen. The hammer bounced off this rock with a clang and they only managed with great difficulty to break away some small pieces, which increased Kashtanov's amazement still further.

"Virgin copper in a solid mass, with the surface oxidised," he said.

"What wealth there is here!" exclaimed Maksheyev. "Whatever ore you want you can have for the asking. Why, you could set up a comprehensive metal works on this spot!"

"Yes, when they run short of ore on the surface of our planet to meet man's growing needs, they'll have to come down here for metal whether they like it or not. When that happens, the ice and the fog and the blizzards will be no obstacle."

"Or else they'll bore a tunnel through the earth's crust so as to get at these tremendous reserves by a short cut," laughed Maksheyev.

At that moment a large shadow passed rapidly over the two geologists, who were absorbed in their inspection of the minerals, and Gromeko called out:

"Watch out for the flying lizard!"

They seized their guns and looked up. A huge, dark creature was hovering about sixty feet above their heads; they had no difficulty in recognising it by its flight as a flying lizard of the pterodactyl breed, but it was considerably larger than those which they had seen on the sea-shore. Its wings measured nearly eighteen feet across. The lizard was looking for prey, lowering its head with the enormous beak and gazing with amazement at the strange two-legged creatures.

But the explorers could not wait for its doubts to be dispelled, for if the lizard hurled itself upon them from such a height it could kill or severely wound them with its talons or its teeth. Maksheyev at once took aim and fired. The pterodactyl flew to one side, flapping its wings wildly, and came down on a projecting piece of rock, where it began shaking its head, opening and closing its toothy mouth.

"I think I've winged it!" said Maksheyev, unable to decide whether to fire again now the creature was so far away.

Just then there was a shout followed by a report from the meadow where they had left the zoologist and the botanist.

A second pterodactyl had flown out from behind the row of horse-tails and ferns which separated the gully from the rocks. This creature bore a large, dark object in its talons. Supposing that the lizard was carrying off one of his friends, in his turn Kashtanov fired hastily. The robber flapped its wings, dropped its burden and fell head over heels behind the barrier of trees.

The geologists rushed towards the spot to help their comrade who had fallen from a height of several yards. But as they pushed their way through the thicket they ran into Gromeko and Papochkin hurrying to meet them.

"What! You're both of you safe and sound? Which of you was in the reptile's clutches?"

The other pair laughed.

"The lizard carried off my raincoat," the botanist explained. "I had wrapped it round the plants I'd collected, and put it down on the grass. He must have thought it was some sort of carrion."

"And I fired at him at once, but apparently missed him," added Kashtanov.

Thus reassured, the geologists went with their friends to the place where the wounded lizard was still flapping about. When they drew near, it got to its feet and rushed at them, beating one wing and trailing the other, which was evidently broken.

It ran waddling like a duck, its huge head thrust forward with the mouth open, making an angry croaking noise. The growth on the bridge of its snout was suffused with blood and had turned dark red. The lizard was as tall as a man and, in spite of its wound, could prove a dangerous foe, so they had to finish it off with a second shot.

While Kashtanov and Papochkin were studying the pterodactyl, Maksheyev and Gromeko went off to look for the stolen raincoat. They searched the meadow right to the foot of the rocks, and groped their way through the thicket, but found nothing.

"Well, I'm blowed! Where can it have got to?" growled the botanist as he wiped away the sweat that poured down his face. "Surely he can't have swallowed my raincoat?"

"I definitely saw him drop it when I fired," Maksheyev declared.

At that moment the other pterodactyl, which had been sitting on its rocky ledge, flew up into the air; it glided down to the tops of the horse-tails, picked a dark object off one of them and flew away with it.

"Devil take it!" cried the botanist, "that's my raincoat again. We were looking for it on the ground and it was up in the trees."

Maksheyev was aiming at the lizard as it flew past when suddenly the raincoat unfolded, a sheaf of plants fell out, and the creature dropped its booty in a fright. The explorer lowered his gun.

"These pterodactyls can't possess much imagination if they steal inedible things like that," said Gromeko, going towards his lost property.

"Maybe they are cleverer than you think. Perhaps they wanted to carry off your raincoat and that hay of yours to make a more comfortable nest for their young?" laughed Maksheyev.

"Hay? How dare you speak so disrespectfully of my botanical specimens! Perhaps you're suggesting that these lizards are so intelligent, that he carried off my raincoat to clothe his naked children?"

"I wouldn't go as far as that. But don't forget that these creatures were the kings of the jurassic age and reached a very high level of development. Why did you gather so many plants of the same kind, though?" he added, as he watched the botanist collecting up a number of stalks that looked like reeds from the grass where they had fallen.

"Do you know what this is?" replied Gromeko handing his companion one of the stalks.

"Some sort of reed, I should say; thick and rather prickly. Only iguanodons would eat it."

"You've guessed right, the iguanodons do like to eat it; but we won't turn up our noses at it either."

"Really? Can we use it for soup, then?"

"No, not soup, but tea. Break the stem."

Maksheyev broke the stem, and a transparent liquid flowed out of it.

"Taste the juice of this despised reed."

The juice was sticky and sweet.

"Can it be sugar-cane?"

"Well, even if it isn't like the sugar-cane which grows on the surface of our planet, it is a sugar-bearing plant of some sort."

"How did you guess it was sweet?"

"I saw a stalk like this in the mouth of the young iguanodon that the ceratosaurus killed in the clearing. I found it was sticky. I looked for places where it grew, found quantities of it beside the stream and, finally, tasted the juice. Our stock of sugar is running low. We can use the sap of this cane instead of sugar, and even extract sugar from it. So you see, my hay is sometimes useful!"

When they returned to the dead pterodactyl, Gromeko showed the others what he had found, the cause of the adventure with the raincoat. They all approved of his scheme and decided that on their way back they would gather as much cane as possible and try to extract sugar from it later.

The explorers pushed on up the ravine, where the little stream ran between fringes of small horse-tails and tough grass.

Soon the ravine became a mere slit in the rock, with the bottom entirely covered with water. It grew dark, gloomy and damp. The explorers walked in single file: Maksheyev went ahead, gun in hand, followed by Kashtanov, testing the cliffs on either side with his hammer.

At last the ravine grew lighter ahead of them, and greenery appeared. The narrow crevice broadened out and became a large hollow, surrounded by rocks, perpendicular at the base but forming ledges higher up, like an amphitheatre. The bottom of the hollow was covered with lush green grass, and in the middle was a lake, which was the source of the brook.

"Phew, how this place stinks!" exclaimed Gromeko, as soon as the explorers came near the lake.

"It certainly does smell very bad—like carrion," Maksheyev agreed.

"Perhaps it's a mineral lake, something like sulphur springs?" suggested Papochkin, leaning over the water.

The explorers looked all round; their attention was caught by a strange hissing sound that alternated with a screech like a cork being drawn across glass. These sounds came from the walls of the hollow above them, but they could not see anything unusual there.

Just then a large dark shape passed across the clearing and

settled on one of the ledges, from which, as it approached, the screeching and hissing became louder.

"A pterodactyl!" cried Maksheyev.

"Evidently this is where the flying lizards have their nests," said the zoologist.

"So that's where the stench is coming from! They seem to be very dirty creatures."

The lizard which had landed on the ledge soon flew up again and, seeing the men in the hollow, began circling above them, uttering staccato croaking sounds. The screeching and hissing on the rocks immediately ceased.

"There, the young ones have shut up!"

"It would be interesting to get some eggs and young birds from those nests," said the zoologist.

"Just try climbing up these rocks and fighting the parents. They'd give it you hot and strong."

"There are a lot of them here," exclaimed Kashtanov, pointing to another pterodactyl which was leaning from one of the ledges, while two were already hovering.

"Well, shall we start shooting?" suggested Maksheyev, who wanted to make up for his recent blunder.

"Why should we? We've already bagged and inspected one, and we mustn't waste our ammunition," Kashtanov warned him.

"We'd better beat a retreat; right about turn, before all the eyries are roused," said the botanist, who was not enjoying the visit to the evil-smelling hollow.

A number of lizards were now flying and croaking over their heads and the explorers decided that it would be wisest to follow Gromeko's advice. At the exit from the hollow they noticed heaps of bones of various sizes, mixed with pterodactyls' droppings.

"We've landed in the rubbish-dump of a colony of lizards," laughed Maksheyev.

"They've chosen a safe place here—why, it's a regular fortress."

"Other reptiles might attack their eggs and their young," the geologist observed. "Note that these reptiles are already birds in their habits."

"Quite true. Their wings have enabled them to change from their ancestors' ways of life."

"It's a pity we can't find out how they build their nests and



The flocks feasting on the carcasses took fright at the men's approach.

what their eggs and their young look like, especially eggs in the process of hatching."

"I don't think they sit on their eggs like birds," said Kash-tanov. "I think they leave them to hatch out in the sun, as other reptiles do."

"Don't worry, we'll find some iguanodon's eggs, or plesio-saurus's eggs, somewhere," said Gromeko, trying to console the zoologist.

"If they're fresh, we'll make a colossal omelette of them. These creatures' eggs must be huge; one would be enough for all of us," laughed Maksheyev.

They went back down the ravine to the clearing at the foot of the heights, gathering the sweet cane as they went, and approached the spot where the savage lizard had been killed.

Great activity reigned there. Flying lizards of different sizes hurried to and fro, and had settled on the carcasses of the ceratosaurus and the iguanodon. They tore pieces of flesh from the bodies, and devoured them on the spot or carried them off towards the south, to the ravine in the hills, where their nests would probably be located. The screeching, croaking and hissing were ear-splitting.

The flocks feasting on the carcasses took fright at the men's approach. Some flew up into the air and circled over the clearing while others, waddling on their short legs and trailing their half-opened wings, ran off to one side. They had evidently eaten so much that they found it hard to fly. Papochkin managed to get two snaps of the scene.

The lizards, gorged with their feast, did not attack the men who had disturbed them, but merely filled the air with various noises expressive of disgust.

After collecting the gammons of iguanodon which they had hidden in the trees, the explorers headed through the forest along the same gully as before. When they were getting near the hollow, Gromeko, who was walking in front, suddenly stopped and showed his companions some enormous footprints, deeply sunk in the moist sand of the watercourse.

"This is no iguanodon," said Papochkin. "This animal walks on all fours. Look, here are the prints of its hind legs, with three toes each, and here those of its forelegs, with five!"

"And the prints are shaped differently and are bigger than the iguanodon's" added Kashtanov.

"Can we tell from the footprints whether the animal is carnivorous or herbivorous?" asked Maksheyev.

"I think it's herbivorous. The toes don't end in claws but in something like a hoof, which couldn't grasp anything."

"And here's the impression of a tail, shorter and thinner than the iguanodon's," observed the zoologist, pointing to a depression winding between the marks left by the feet.

"In any case, it's a huge animal and it can't be far from our lake, since there's no track coming back," said Gromeko.

"Yes; we'll have to keep our eyes skinned and our guns at the ready," said Maksheyev.

Slowly, step by step, the explorers advanced up the streambed, keeping a keen watch ahead. Nothing appeared, however, only the dragon-flies and beetles hovered and fluttered above the tops of the horse-tails and ferns. On reaching the cliffs after passing along the narrow green corridor the explorers stopped, undecided what to do next.

Whispering to his companions to wait, Maksheyev went forward to the crack in the rocks, then signalled to the others to join him. When they had entered the hollow they hid behind the trees near the entrance and witnessed a curious spectacle.

A monster was grazing there which in its size and strange appearance outshone everything that the explorers had so far seen in Plutonia.

The animal was twenty-five feet long and twelve feet high. Its forelegs were considerably shorter than its hind legs and its massive body leaned forward; it had a surprisingly small head, like that of an ordinary lizard. Two rows of shield-shaped plates ran along its backbone. These stuck up and bent outward, like small wings. There were three pairs of very large ones on the creature's body, three pairs of small ones on its thick neck and two pairs on its tail, which, shorter and less massive than those of the iguanodons and ceratosaurus, also carried two pairs of long spikes sticking up below the plates. The monster's naked, wrinkled skin was dotted here and there with wart-like lumps, smaller and more numerous on the neck and head, larger and more widely spaced on the body and tail. Dark brown spots and patterns on the skin's dark green background made the animal's appearance even more repellent.

It was quietly grazing by the lake shore, tearing off bundles of sweet cane and small horse-tails with its big mouth, which

was quite out of proportion to its little head. As it moved the plates along its backbone flapped a little, like wings.

"Just like Cupid's wings!" whispered Maksheyev.

"A charming jurassic Cupid!" laughed Gromeko. "I'd never have believed that such terrifying scarcecrows existed."

"It's frightful appearance, the plates, the spikes, the warts, the patterns—they are all just means of scaring off the enemies of this animal—which is probably quite peaceful and inoffensive," said the zoologist, who had already taken several photographs. "What's this Cupid called?" he asked, turning to the geologist.

"It must be a stegosaurus, the most unusual of the dinosaurs. This group includes the iguanodons, the ceratosaurus and the triceratops which we saw earlier. In the upper jurassic period there were several species of these monsters; their remains have been found in North America."

After staring at the lizard, the explorers fired a shot which echoed back from the rocks and a chorus of frantic creatures' voices broke out.

The frightened stegosaurus retreated as fast as it could, lurching like an ambling horse, its backbone plates clashing together and making a loud clattering like castanets.

When it had disappeared, the explorers came out of their hiding-place, drew some water from the lake and proceeded on down the gully to their camp, looking forward with pleasure to their lunch of fried iguanodon and a rest by the shore of the calm sea.

XXXI

CLEANED OUT

WHAT was their surprise when, on coming out of the forest on to the shore they found their tent had vanished.

"We've made a mistake, I expect, and come out at the wrong spot," suggested Kashtanov.

"That's impossible," replied Maksheyev. "We've just climbed over the fence which we put up yesterday at the mouth of the gully, near the camp-site."

"All right, then; but in that case where's our tent?"

"And all our things?"

"Where's General?"

The explorers, flabbergasted, hastened to the spot where their tent should have been. There was nothing there; neither tent nor baggage, not even a scrap of paper. Nothing but the embers of the dying fire, and the holes in the ground left by the vanished tent-pegs.

"What does this mean?" said Gromeko, as the four gathered round the remains of the fire on which they had counted to cook their iguanodon.

"I don't understand it at all," muttered Papochkin in a strangled voice.

"It's as clear as day: we've been cleaned out," exclaimed Maksheyev.

"But who's done it?" cried Kashtanov. "Only creatures of intelligence could have done such a thing, and we've met none during the whole journey since we left the *Pole Star*."

"Iguanodons couldn't have carried off our belongings!"

"Nor stegosauri!"

"Nor plesiosauri!"

"But perhaps those blasted pterodactyls carried them off to their nests?" suggested Gromeko, remembering the adventures of his raincoat.

"That's hardly likely. Would they have taken the tent, and the pots and pans and the beds, and every single little thing? I can't credit them with such highly developed intelligence as that," replied Kashtanov.

"And what's become of our boats?" exclaimed Maksheyev.

They all ran to the edge of the forest, where they had hidden both boats and oars in a thicket. They were still safely there.

"We left the raft on the shore, by the tent," said Gromeko. "And now it's gone with the rest of our belongings."

"What are we going to do now?" exclaimed the zoologist, voicing the general perplexity. "Without the tent, without stocks of food or clothing or eating utensils we shall have no chance whatever of surviving on the shore of this accursed sea!"

"Let's examine the position coolly," suggested Kashtanov.

"First of all, I propose we have a rest and recover our strength: hunger and exhaustion are bad counsellors. We've brought back meat, now let's make a fire and cook it."

"And drink sugar water," added Gromeko, pointing to the pail of water and the bunch of sweet cane they had brought with them.

They built a fire, cut the meat into pieces, skewered them on sticks and put these into the fire to cook. Sitting by the fire sucking stalks of cane and washing this down with water, they went on discussing the mysterious disappearance of their tent.

"Now we know how Robinson Crusoe felt on his desert island," joked Maksheyev.

"But with the difference that there are four of us and that we have guns and a certain amount of ammunition," remarked Kashtanov.

"We must count our cartridges and only use them in extreme need."

"There are about two glassfuls of cognac left in my flask," said Gromeko, who, being a doctor, always kept a supply for use in emergencies.

"And in my satchel I've got the small kettle, the collapsible cup, and a little tea," put in the zoologist, who never set out on a trip without these objects.

"That's fine. We can at least cheer ourselves up now and again with a drop of tea," said Maksheyev. "I'm afraid I've nothing but my pipe, some tobacco, a compass and my notebooks in my pockets."

"And mine are the same, except for our hammers."

"The shashlik's ready!" cried the botanist, who had been looking after the meat-spits.

Each took a spit and they all fell to. But the meat did not taste very pleasant, as they had no salt.

"Fancy being without salt on the seashore," said Maksheyev. "We ought to have dipped the meat in the sea-water."

While they were eating, the zoologist's kettle boiled and each in turn took a small cup of tea, sweetened with the sap of the cane. As they drank and smoked they returned to the discussion on their next move. They all agreed that they must pursue the thieves as soon as they had ascertained in which direction the latter had gone off.

"We must examine the ground round the camp, thoroughly,"

said Maksheyev. "The thieves may have come and gone by air, as Mihail Ignatyevich has suggested but which seems to me improbable, or by sea, using our raft, or by land. But even if they left by sea they must have gone as far as the water by land. So, unless they did come by air they must have left tracks on one side or other of the tent."

"What a pity we didn't think of that at once. By running about as we did, we may have obliterated their tracks."

"It's impossible to go any further east along the cliffs, we saw that yesterday," Maksheyev went on. "They could hardly have left by the gully, either: it was fenced off, and, besides, we didn't meet anybody or see any suspicious footprints. So we must look for the thieves' tracks either on the shore here or else to the west, further along the shore."

"Quite right," said Kashtanov. "Those are the two most likely directions."

"Let's get to work, then. I'm a good deal more experienced in tracking than the rest of you," said Maksheyev; "I propose that you stay here till I've examined the ground around the camp-site."

Going down on his knees, Maksheyev began carefully studying the ground surrounding the spot where the tent had stood; then he went to the seashore and examined the place where the raft had lain, then turned and walked along the edge of the sea. After going about two hundred paces he thrust a stick into the sand and returned to his comrades.

"The thieves were not men, nor any sort of reptiles. Judging by the prints of their feet scattered about they were large insects. There were a lot of them, several dozen. At first I thought they had taken our things away on the raft, by water, but the tracks don't reach as far as the water and there's no sign that the raft was dragged into the water, either. Its disappearance is quite incomprehensible. They partly carried and partly dragged the tent and the other things across the sand to the west, along the seashore. The thieves have six legs and their bodies are about a yard long, judging by the impressions they've made in the sand."

"Some vermin!" exclaimed Papochkin.

"But what's happened to General?" demanded Kashtanov. "Have they killed him or dragged him away alive to eat him, or has he run off somewhere, frightened by the burglars?"

"There are a lot of General's tracks around the tent, but they are mostly criss-crossed by the tracks of the insects, so General's must have been made first. There's no fresh blood to be seen, nor any pieces of insects that the dog might have torn off. I think General must have fled from the strange enemy hordes and hidden in the forest. I've still got to examine the ground along the edge of the trees."

With these words Maksheyev again began to study the tracks from the site of the tent to the fringe of the forest, along which he walked to and fro several times, gazing attentively at the ground; at last he stopped and called to his friends to join him:

"This is where General fled into the woods; but before that, something must have happened to him, for he was dragging his hind legs along the ground."

Cutting away the lower branches of the horse-tails with his hunting-knife, Maksheyev wriggled his way, stooping, into the thicket. He kept whistling for the dog, and then pausing in hope of an answer. At last a feeble whine was heard, and General crawled out from under the drooping branches. He was in a terrible state, his whole body swollen and his hindquarters dragging helplessly.

"What's happened to you, General, poor old thing?" said Maksheyev, stroking the animal's head as it licked his hand with a welcoming whine. The engineer crawled back out of the dark thicket followed by the dog, whose pitiful appearance aroused universal sympathy.

"Perhaps the robbers have broken his back?" suggested Papochkin.

"I don't think so," replied Gromeko, examining the dog. "No, they haven't," he went on; "it seems that they've put him out of action with poisoned arrows. There are a number of tiny wounds on his back, with the blood already clotted, but his spine is unbroken."

"What do you mean, arrows?" said Maksheyev, in amazement. "The robbers were insects, after all!"

"Of course, I forgot. In that case they must have stung him or bitten him, with poisoned jaws or stings."

"What are we to do with General? Can we cure him?"

"I think we can. If the poison had been deadly he would have died already. Unfortunately our medicine chest has been carried

dead?" They fired questions at Kashtanov, realising now why he had returned so unexpectedly soon.

"He's alive. We had an encounter with some ants too, and Semyon Semyonovich was so badly stung in the leg that he was laid out. Lend me a hand to bring him into the tent."

"Just a minute, give us a chance to get dressed," said Gromeko, who only now noticed that both he and Maksheyev were still naked.

"Yes, how is it you're both in this state?" laughed Kashtanov. "Were you bathing when the ants attacked the camp?"

"No, it was the brontosauri who gave us a bath again," answered Maksheyev. While he was dressing he told Kashtanov all that had happened.

Having hastily got some clothes on, Maksheyev and Gromeko followed Kashtanov to the riverside where he had left Papochkin in the boat when he advanced to attack the ants. The wounded man had been sleeping so soundly that he had heard neither shots nor shouts, and he only woke up when they took him by the arms and legs to carry him to the tent.

When they had put Papochkin to bed, the explorers hung up the remaining fishes, then dragged the dead ants down to the sea; this disagreeable job finished, Kashtanov ate up what was left of the soup and told his comrades of his adventures during the ill-fated expedition.

It was much to be feared that the ants, having twice suffered at the hands of the uninvited newcomers, might return in force to take their revenge. The question arose of what to do next. Papochkin and Gromeko advocated resuming their sea-voyage forthwith, so as to get as far away as possible from the anthill. But Kashtanov wanted to continue with the expedition up river which the ants had interrupted, since this would enable them to penetrate into the mysterious black desert. Maksheyev supported this plan. To carry it out successfully they must find some way of finishing off the cunning insects, whose continued existence endangered the expedition. Accordingly, they decided to wait until the evening, then row up to the anthill and set fire to it while the insects were asleep. If they succeeded, their route up the river would be clear and all four could complete the expedition in the two boats, leaving the raft and their unwanted things by the sea-shore.

XLIII

THE BURNING OF THE SECOND ANTHILL

WHEN they had had a good rest, Kashtanov and Maksheyev set off in one of the boats, taking guns, an axe and some brushwood faggots. Papochkin could not walk yet, and the sting in Gromeko's hand was causing him severe pain, so these two were left to guard the tent. Kashtanov and Maksheyev travelled quickly past places already familiar to the former. They passed the remains of the barrier built by the ants, where the burnt tree-trunks were still smoking and the insects' blackened carcasses lay around. Then they emerged into the open space, and from behind bushes inspected the terrain around the anthill, so as not to stumble on any of the enemy unawares. But no ants were to be seen. The insects were apparently taking a siesta in the depths of their fortress. The explorers rowed a little further until they reached the place where the bridge had been; from here a track made by the insects led to the anthill. It turned out that the ants had already built a new bridge.

The explorers tied up their boat among the bushes near the bridge, hoisted the bundles of wood on to their shoulders, took up their loaded guns and advanced towards the anthill. Before reaching it they crouched behind some bushes to observe it a little longer and make sure nothing would hinder them in carrying out their plan.

Silence reigned; they could proceed to work. They laid a faggot of brushwood in each of the main entrances and on top placed some drier and thinner trunks, taken from the building itself.

Then they set fire to the pile of fuel at the western entrance, the one farthest away, and ran headlong, one towards the northern and the other towards the southern entrance, to set these alight. After that they intended to meet at the eastern entrance, where they would complete their incendiary task and whence they could flee to the boat, if necessary.

When lighting the fire in the northern entrance, Kashtanov noticed an ant hastening towards the obstruction from the depths of the gallery. He hid behind the fire, hoping that this sentinel would come outside, when he would kill it before it

raised the alarm. But the ant, after inspecting the fire and trying to pull it apart, ran back into the anthill, evidently to get assistance. The alarm had thus been given, and Kashtanov had to hurry to the last entrance.

Maksheyev was there already; he hastily lit the fire, and as he did so, shouted:

“Quick, quick! We must get to the boat.”

The two men ran off as fast as they could, but on the way stopped to look back. A huge tongue of flame had already burst from the mouth of the eastern entrance. On the north side too, the anthill had caught fire at several points, and dense smoke was pouring from a number of the upper outlets. On the south side, however, where Maksheyev had been in a great hurry to finish when he saw that the insects were being roused, the fire had not caught effectively and there ants were emerging in procession from all the upper outlets. Some dragged eggs or pupae, climbed down with them, and carried them away. Others rushed stupidly hither and thither, running into the flames or the apertures that were pouring out smoke, and fell down, burned or suffocated.

“Our stunt hasn’t come off,” said Kashtanov. “Some of the ants will escape; they’ll wander at large about the country and attack us. Tomorrow we’ll have to push on.”

“We’ll have to push on this very minute!” shouted Maksheyev, pointing to a column of ants fleeing along the road towards the bridge.

“Are they running to fetch water, to put the fire out?” joked Kashtanov, breaking into a trot alongside his comrade.

There was no doubt that the ants had noticed the incendiaries and were after them. They ran faster than the men, and the distance between them grew shorter and shorter.

“I can’t run any more, my heart won’t stand it,” gasped Kashtanov, whose age and way of life did not permit him to keep up with Maksheyev for long.

“Let’s halt and give them a volley,” suggested the latter.

They were able to take a breather until the insects were within fifty paces of them, when they fired. The ants at the front of the column fell and those behind stopped in their tracks. There were not more than a dozen of them, but a second contingent was following at some distance. Gathering their last reserves of strength, the fugitives ran to the bridge,

reaching it just as the reserve force arrived on the battlefield.

"What the devil, where's our boat?" exclaimed Maksheyev, who was the first to arrive on the river-bank.

"What, isn't it there?"

"No, it's vanished."

"Was it tied up here?"

"Yes, this was the spot, I remember it well. . . . Why, there's the rope it was fastened with, hanging on a bush."

"Who can have untied our boat and taken it?"

"Perhaps it came loose by itself and was carried downstream by the current."

"Or perhaps the ants bit through the rope."

"What are we to do?"

"Let's get across the bridge and destroy it behind us," suggested Kashtanov. "At least the river will be between us and our pursuers."

Without losing any time, they both crossed the little bridge, which bent under their weight, to the far bank. Their pursuers were only a hundred paces from the river.

"Pull the logs on to our side, or the ants may fish them out," urged Maksheyev.

A moment later the leading ants reached the river, but both the logs that had constituted the bridge lay at the explorers' feet. A deep river separated them from their foes, who had stopped in confusion on the bank. There were about twenty of them, but still more reinforcements were visible on the road behind them, hurrying to their aid. Behind them the anthill was blazing like an enormous bonfire. The flames soared high and clouds of black smoke poured out into the still air, forming a black pillar which rose to a great height.

"It might almost be the eruption of a volcano," laughed Maksheyev. "At least we've made them pay for all the trouble they've given us."

"But we haven't achieved the result we desired—we haven't cleared them out of the area; and now we're fleeing ignominiously before a horde of insects."

"How are we going to get back to the sea?"

"It's out of the question to walk along the river bank, through the forest."

"We shouldn't get through there very fast, and meanwhile the ants might outrun us and attack our friends."

"I've got it! If we can't walk, we'll float down. It won't be difficult to make a little raft of these two logs, and the water will carry us faster than our legs."

"That's an idea. But first of all we must drive off those ants, so that they don't hinder our departure."

The explorers loaded their guns and fired four times into the group of insects crowded together on the opposite bank. More than a dozen fell dead, some rolled into the water, and the rest scattered. Within a few minutes the two logs which had constituted the bridge had been tied together with slender withies from the bushes and lowered into the river. The two men clambered on to their improvised raft and pushed off from the bank, casting a last glance at the burning fortress. The water carried them rapidly down, and they used their guns instead of poles to fend themselves off from the bank when one end or the other of the raft approached it too closely. A few of the ants ran along the riverside after them, but the current was faster than they, and they were gradually left behind.

Round the bend in the stream, just in front of the forest verge where Kashtanov had made his floating fire, to their great joy the navigators saw their boat; it had been carried into the bank by the current and was stuck in some bushes.

The raft was likewise carried to the same spot; they caught the fugitive, got in, and started rowing. In half an hour they had reached their camp, without further mishap.

XLIV

ANOTHER TRIP INTO THE INTERIOR

THE failure of their plan to destroy the ants compelled the explorers to leave the seashore without delay. In any journey they now made into the interior they risked meeting the enraged insects, who had lost their home and would be wandering about all over the place. They would have to devote all their energy to waging war on them, and all their ammunition

too, of which not very much was left. Even in their own camp they were in constant danger of an attack by ants, which might mean disaster.

Over breakfast they heatedly discussed the problem of whether to push on along the southern shore to the west or to turn back and proceed eastward. Finally they decided to carry on westward.

They sailed, as before, close in to shore, and were soon out of the bay. Ahead of them the southern shore was drearily monotonous. Having spent a fortnight amid the animal and plant life of the jurassic period, the explorers were so used to it that they found it somewhat dull. What they wanted now was to get further south, in the hope of encountering still more ancient flora and fauna, experiencing new adventures and obtaining new impressions.

But their further progress southward was barred by the desert, and a voyage either east or west only promised the same jurassic landscape. They had all begun, too, to think about their journey back to the north.

Several times along the shore they noticed ants from which they could conclude that these insects were widespread all along the southern shore and that they really were the kings of the jurassic world.

"It's lucky, anyway, that they spend part of their time sleeping," remarked Papochkin. "Otherwise they'd make life impossible for us."

"Yes, these vermin are worse than sabre-toothed tigers and carnivorous lizards. None of those caused us a hundredth part of the unpleasantness and trouble that the ants have given us," Maksheyev agreed.

They spent the night on the beach. They decided to sail one more day westward, and then, if they had not been able to get through to the south, to turn back.

This last day brought them the hoped-for change of fortune. The shore soon began to bend away more sharply to the south, though remaining the same in character. Within a few hours they were able to make out, however, that the green wall of forest would soon come to an end and that beyond it a line of cliffs began.

"Again that plateau, with the black desert on top of it!" cried Kashtanov, studying through his field-glasses the country

that lay ahead. There was disappointment in his voice.

But on reaching the end of the forest they saw that between them and the foot of the plateau lay a large bay; there was a green valley at the back of it, and beyond this, a group of high, dark, pointed hills.

"Volcanoes again! But quite near the shore this time," said Gromeko.

The boats headed for the mouth of the valley, on the southern shore of the bay, where they could see a level tract of sand.

A fairly large stream flowed down the valley, bordered by trees, bushes and meadows. They pitched their tent on the beach. In the meadows they found dragon-flies, beetles and flies; there were also spoors of iguanodon and pterodactyl, but no trace of ants.

After lunch they made towards the volcanoes, but first, as a precaution, hid the boats, the tent and their baggage, in a thicket, tying some of the things to trees. They took General with them.

They walked up the valley, close to the stream. The groves beside the banks were not impenetrable and were intersected by iguanodons' tracks. In the cliffs on both sides Kashtanov identified the same rock that he had encountered much further north, along the Maksheyev River—olivine sprinkled with nickel-iron. Here, however, the sprinklings of nickel-iron had often become large pockets, half a yard or a yard across.

"What splendid material for steel!" exclaimed the engineer, halting in amazement and enthusiasm before the tall, sheer cliff, with its plentiful pockets of metal, gleaming dully in Pluto's rays. He gazed at this wall of rock with the same sort of longing as a child looking at a sugary bun full of raisins.

"Ah, what a colossal works there could be here!" he said sadly.

"Even in spite of the ants?" asked Kashtanov, with a grin.

"In spite of anything! If it were essential to exploit all this wealth, wouldn't men find some way to exterminate those loathsome insects? In their hunt for gold the Europeans have ousted the warrior Redskins, the Australian aborigines, the Bushmen and the Kaffirs. One big gun and a few grenades would be enough to stamp out all the anthills on this shore, with their inhabitants." Large pterodactyls now and again flew over the valley, looking for prey; evidently their eyries were

somewhere near by in the inaccessible cliffs. They could not bring themselves to attack the men, but when General ran too far ahead of his masters, or lagged behind, one of these lizards would appear circling above him waiting for a suitable moment to swoop down. Gromeko fired twice at the pterodactyl and the second time shot it down. The wounded creature was left floundering in the upper branches of a tall tree-fern.

They met a herd of iguanodons resting in a meadow at the foot of the rocks, but they put off the hunt until the return journey, so as not to burden themselves with a load of meat.

After three hours' peaceful walking they reached a place where the valley turned sharply westward. Here its right-hand slope was formed by the sides of a group of volcanoes. The road became more difficult; from time to time they had to make their way across lava, clambering over black boulders of it.

They found a spot in a little meadow suitable for spending the night and containing a few dry horse-tails for their fire. Here they dumped their supplies and other impedimenta and then set out unburdened to explore the area.

Between the tips of two broad streams of lava that descended from the volcano was a small lake, about fifty yards across, fringed by clusters of short palm-trees and horse-tails and a narrow reed-bed. A brook flowed out of this lake and ran along the lower of the two streams of lava. The lake was as smooth as a mirror and reflected every detail of its green frame, of the black streams of lava and of the gloomy cliffs.

"What a marvellous little place this would be for a hermit who wanted to renounce the world and its vanities!" exclaimed Papochkin. "He'd build himself a hut under that dark wall and live by the banks of this calm lake in the shade of the palm-trees, contemplating the clear sky, the eternal sun and the mighty volcano."

"And one fine day he'd be killed by a hail of stones or a river of lava thrown up by the perfidious volcano," observed Kashanov.

"If he had not died earlier on from hunger," added Gromeko. "for, so far as I can judge, these palms bear no edible fruits and the cane isn't sweet."

"And there's no game to be seen," said Maksheyev.

"You poor miserable realists! You won't even let a man dream. The hermit might cultivate a field or a little orchard, perhaps

a vegetable garden. There's water here, and grapes grow well on old lava . . ."

The zoologist was unable to finish his sentence, for from the side of the volcano, the main peak of which was hidden under recently conglomerated lava, came a rumble like that of thunder, and a few moments later a rain of small black stones fell around the explorers.

"There you are! His Majesty warns you that he won't allow your hermit to raise grapes on old lava," laughed Maksheyev.

"Let's have a look at the lake and then go back to our dump. It's safer there," suggested Kashtanov.

As the explorers were climbing down across the lava towards the lake the rumbling was repeated, followed by another shower of little stones.

"The volcano's not pleased with its uninvited guests. It's afraid we're going to plunder the riches of its crater just as when we managed to steal that sulphur from Satan's crater before he woke up."

"Let's call this volcano Grumbler," suggested Gromeko.

This name met with approval and was duly marked on the map which Kashtanov had sketched. The lake was named Hermit's Lake and the stream that flowed from it received the name of Papochkin.

"There, we've even immortalised our castles in the air," laughed Maksheyev as he wrote down these names.

The water of the lake was cold and fresh, and tasted a little like seltzer, and indeed bubbles of carbon dioxide were given off when it was heated a little.

The explorers circled the lake until they found a convenient spot, then bathed with delight in its bracing waters; on diving in they discovered that it was not more than nine feet deep, and contained neither fish nor water-plants nor insects.

As it was still too early to go back to the camp-site, they decided to climb up to the plateau. This was not difficult, as the uppermost stream of lava had flowed against the cliff and the boulders of congealed lava formed a huge flight of steps. By clambering from one boulder to the next, the explorers quickly reached the top.

Eastward, below them, lay the lake, in a deep hollow, and beyond it rose the dark, scored and pitted slopes of Grumbler, whose steep cone loomed over all. A column of black smoke

escaped from the summit, climbing to an enormous height in the still air. To the south, west and north a black desert spread away, exactly like that surrounding the Satan group of volcanoes. To the north the desert was bounded by the blue expanse of the sea, but in all other directions it reached to the horizon.

"Grumbler is a lot bigger than Satan, and its slopes are steeper," observed Kashtanov.

"And the eruption that's beginning will prevent us from climbing to the top of it," added Maksheyev.

"We'll see about that tomorrow. We don't need sulphur now and we can turn back whenever we like."

They returned towards the lake, following the same route as before through the streams of lava, and within an hour found themselves back at their camp-site again.

XLV

GRUMBLER'S PRANKS

GRUMBLER, however, did not let them sleep in peace. A few hours later they were aroused by a frightful roar and jumped up in alarm.

"Is this volcano going to send out burning clouds, too? Look over there!" exclaimed Gromeko.

Grumbler was shrouded in dense black clouds which were rolling lower and lower down the slope while at the same time spreading out on either side. There was a strong smell of sulphur and chlorine. The clouds swirled, lit up by bright flashes, and the roaring and rumbling from the interior of the volcano merged with claps of thunder.

"No," said Kashtanov. "We've no need to fear burning clouds this time. This is a different sort of eruption, the Vesuvian type. There'll be ash and bombs in a minute, and then, probably, lava as well."

"No hope of our climb up now, of course."

"No, indeed. It would be crazy to go climbing about on a volcano in that state."

"What shall we do?"

"Let's stay here, or else get back to sleep; afterwards we'll return to the seaside."

"Why not at once?"

"It's interesting to observe an eruption at such close range."

"But suppose it scatters some of its little bombs on us?"

"That's unlikely; we're at the very foot of the mountain and out of their range."

"Suppose the lava engulfs us?"

"Lava flows slowly and we could always escape from it, even on foot."

"All right then. Let's stay and watch Grumbler at work. But, meanwhile, don't let it stop us from having our breakfast."

They lit a fire, put the kettle on it, and while eating they watched the volcano. It was completely hidden by the clouds and even the sky above them was covered with grey smoke, through which Pluto appeared as a red disc throwing a dim, malignant light over the gloomy scene.

Soon black powdery ash began to fall; at first it descended in separate particles, then came thicker and thicker, so that they had to cover the cups with their hands, to save themselves from swallowing volcanic dust. The grass, the cane and the leaves of the palm-trees gradually grew black, and the water in the stream turned to ink.

"It's a good thing we thought of bringing water in our container," Maksheyev remarked. "Otherwise we'd have been without any all day. But what's that row?"

As the roaring of the volcano faded away, in the intervals between peals of thunder they could hear a dull booming, like the sound of surf on the seashore, gradually getting stronger. The explorers looked at each other in perplexity.

"Is it the burning cloud?" asked Papochkin, in alarm.

"We must run higher up, as fast as possible!" cried Kash-tanov. "A wall of water or mud will come rushing down the stream. I'd forgotten that that might happen. We must collect our things and get up the slope!"

The unfinished cups were swiftly emptied and guns and other belongings assembled, and all hastened to climb farther up the lava bed, scrambling from boulder to boulder, and stumbling as they tried to get to safety high above the stream.

When at last they stopped to take breath, at about fifty yards



A frenzied flood of dirty water was rushing along the stream
which ran down the side of the volcano.

above the camp-site, and looked back, they saw that their flight had not been a moment too soon. A frenzied flood of dirty water was rushing along the stream which ran down the side of the volcano, tearing away great boulders of congealed lava from the banks. In a few moments this terrible wall of water, about nine feet high, reached the place where they had just been drinking tea so light-heartedly; in a flash its muddy waves had overwhelmed the green bushes and shaken and thrown down the palm-trees—either snapped off or torn up by the roots—and the little meadow had vanished as though it had never been there at all.

"Smart work, eh?" exclaimed Papochkin. "We got away in the nick of time."

In their flight the explorers had climbed higher than the lava bed and now they could see both the peaks below them. The river of mud emerged from the right-hand peak, and now they all looked to the left to see what would happen there. In a few moments a second muddy stream was rolling along the narrow gully that ran down the left-hand peak—moving more slowly, however, than the first, for the water was saturated with ash and little stones and looked like liquid black porridge, with uprooted bushes and palm-tree trunks whirling round in it.

"It's torn them from the shore of the lake where we were yesterday!" Papochkin exclaimed.

"So much for your hermit's peaceful, idyllic sanctuary! The lake's gone—everything's drowned in mud," said Kashtanov.

"Yes, these volcanoes are certainly very uncomfortable neighbours," observed Gromeko. "Satan regaled us with a burning cloud and Grumbler treats us to a deluge of mud."

"Still, we escaped both times, and we've witnessed some very awe-inspiring and interesting natural phenomena," said Kashtanov.

"But now we're cut off from the sea and from our boats!" cried Papochkin, utterly dejected. "Just look; stormy floods to right and left, and behind—Grumbler, who's quite likely got some further surprise in store for us."

The explorers, who had taken refuge from the rivers of mud on the rocks of the volcano, were indeed encircled and unable to make their way down the valley to the sea. Behind them, moreover, the volcano went on rumbling.

"If lava starts coming down from up there again, we'll be

between fire and water. A nice prospect!" added Gromeko.

"Yes, Grumbler's a long way from having said his last word," remarked Maksheyev.

"I think our fears are premature," was Kashtanov's comforting reply. "The deluge of mud will soon pass, and we'll reach the sea before the lava catches us up—if it comes this way at all."

"And meanwhile here we are soaked to the skin. There's no cover anywhere," moaned Papochkin.

The zoologist was quite right. Rain had for some time been drizzling from the clouds thrown up by the volcano, though the explorers, preoccupied with the rivers of mud, had paid no attention to it. Now it was raining harder and they all began looking about them for shelter. Counting on the good weather lasting for several days, the explorers had set out lightly equipped, with neither waterproofs nor tent, and so they now had no means of protecting themselves from the rain.

"I think that higher up, where there are so many big boulders of lava, we'll probably find some sort of refuge," said Maksheyev, pointing up the slope.

"But we'll be even nearer to the volcano!" gasped Papochkin.

"Just as you please; stay here in the rain, then, while we climb up there," said Gromeko.

But the zoologist had no wish to be separated from the others and they advanced up the steep incline all together. Both the stones and their boots were wet and progress proved slippery and difficult. However, they soon reached the big ridge of piled-up boulders that marked the end of the more recent lava stream, which had poured out over the older one. Here and there between the boulders there were gaps, each large enough to shelter a single man. All four explorers stowed themselves away in these lairs, while General, soaking wet, crept in alongside Maksheyev, who was not particularly delighted with his company. They spent some unpleasant minutes wet through and twisted into uncomfortable positions on the uneven stones; to keep up their morale they shouted to each other from their respective hiding places whenever Grumbler's roaring abated a little.

The rain fell unceasingly. Soon torrents and rivulets of dirty water, full of ash, were flowing over the surface of the lava bed and making life still more disagreeable for the refugees. One of them got a cold shower down the side, another down the back.

Papochkin, stretched out on his belly in a long, low hiding-place, felt water pouring in on him; he crawled out and began dashing about among the boulders in search of a better spot.

Maksheyev guffawed when he saw this, having managed to tuck himself and General into a little cave in the lava.

"It's not Grumbler he should be called," shouted the zoologist, as he clambered about the rocks, in the rain, "but Weeper, Waterer, Drowner."

"Let's call him 'Showerbath'!" suggested Maksheyev.

But Papochkin was not listening. He had found a cleft in the rock somewhere low down and was crawling into it head first. It turned out to be too short, however, and his legs remained outside, getting wet.

Suddenly a terrific roar rent the air. It seemed to the explorers that the stones were on the point of crushing them like mice in a trap. They all jumped out of their hiding-places.

"An earthquake!" cried Gromeko.

"The volcano's blown up and is collapsing on top of us!" Papochkin wailed.

"Is it the burning cloud?" whispered Kashtanov, paling.

Nothing could be seen through the curtain of rain and cloud, and after the first instants of alarm they calmed down somewhat. Then, with a hollow crash, a bomb as big as a man's head fell near them; it was covered with spiral grooves and it began hissing, crackling and steaming as the rain fell on it. To right and left, above and below, they heard similar thuds and crashes made by falling stones.

"Back to your places at once!" cried Maksheyev. "Grumbler's started a barrage of big-calibre shells!"

They all hurried back into their lairs, and from there watched, with sinking hearts but not without interest, the falling and hissing of bombs of various sizes. Some, striking against the boulders, burst into fragments, like grenades. The shower was soon over, however. A gust of hot wind swept down the slope, smelling of sulphur and burning. The clouds began to disperse, or to rise higher. The bombs stopped falling. Maksheyev resolved to take a look out of his cave.

"Grumbler has taken off his cap and put out his red tongue at us," he cried.

The others also crawled out and looked up.

Above them, showing at moments through the black clouds,

was the summit of the volcano, with a short fiery-red tongue of lava hanging from one side of it; it seemed to be mocking the men who had dared to violate its age-old solitude.

"Yes, the lava's appeared now," said Kashtanov.

"It's not exactly getting any better, is it?" laughed Gromeko. "First he tried to drown us in mud, then to quench us with water, then to slaughter us with bombs, and as none of those methods did the trick, as a last resort he's pouring lava over us."

"Be brave, Semyon Semyonovich! This time it's the end of you," said Maksheyev banteringly.

"Bah!" snapped the zoologist. "If the danger were so great you yourself would be running away as fast as you did when the rush of mud came."

"We'll get clear of the lava without hurrying," observed Kashtanov.

But there was nowhere for them to go. The muddy torrents still swirled in both the river-beds and it was impossible to get across. Above them the red tongue was rapidly lengthening, while from time to time disappearing beneath the clouds of white steam that rose from its surface.

"Grumbler made us wet and now he's going to dry us out. When the lava approaches we'll let our clothes dry and then . . ."

"And then we'll get them wet again crossing the river—unless we drown in it," said Papochkin, finishing Gromeko's joke for him.

But the air having cleared of ash and cloud, Pluto shone through, and the slopes of the volcano soon began drying. The black boulders of lava steamed as though heated by underground fires.

The explorers took off their clothes and after wringing out the water, hung them on stones. Gromeko stripped to the skin and, as he basked in Pluto's rays, advised his comrades to follow his example.

"But suppose Grumbler sends us another lot of bombs? It won't be very comfortable, squatting naked in our hiding-places," observed Maksheyev.

"Once the lava appears, explosions and eruption of friable material usually cease," Kashtanov explained.

"But if we have to run away from the lava we shan't have time to dress."

At that moment a white cloud of steam burst out of the summit

of the volcano, and a wall of fire appeared on the brim of the crater and began rapidly slithering down the slope.

"The first stream of lava headed towards the valley and the lake," observed Kashtanov, "but this one may easily come our way!"

"How long will it take to reach us?" the others were interested to know.

"An hour, perhaps, or a little more. It depends on the properties of the lava. If it's heavy and easily-melting it will be liquid and flow fast; but if it's light, viscid and rich in silica, it won't melt easily and will move slowly."

"What sort of lava is Grumbler sending us?"

"So far, judging by what we've seen of the old lava streams, he's been pouring out heavy lava. Probably it will be the same this time too. Judging by the rocks we've encountered in Plutonia—which are very heavy and rich in olivine and metals—it's unlikely that these volcanoes would give out light, siliceous lava."

"So we ought to get away as quickly as possible?"

"Yes; but I hope that before the lava reaches us the streams of mud will have dried up and we'll be able to cross one of the river-beds without difficulty."

Pluto, refusing to be hidden by the big clouds, and helped by the hot wind that blew from the volcano, speedily dried out the explorers' clothing. They dressed, keeping their eyes on the volcano, while waiting for a chance to escape. The end of the long tongue of lava was hidden behind the crest of the slope; it was evidently sliding into the valley where the lake had been, among Grumbler's western foothills. Further floods of lava poured forth from the crater, some spreading the same way and some more to the north, probably forming a second stream which would run down the northern or the north-western slope. If the latter, it would flow towards the men, but the earlier accumulations of lava in front of them prevented them from seeing which way this stream was flowing.

The muddy water had markedly decreased, especially in the left-hand river-bed. This was no longer a wild flood but merely a dirty little river which they could wade across without much risk.

XLVI

A DESPERATE SITUATION

HALF an hour passed. The eruption went on at a slow pace, the explosions in the crater being infrequent and feeble. But now, above the place where the observers were sitting they heard a hollow rumbling and rustling, reminiscent of the sounds made by a great river when a lot of ice is drifting down it. There was a ridge of enormous lava boulders up that way; evidently the edge of the old lava stream, which had stopped at that spot.

"It's time to go, I think," said Kashtanov, getting up. "The lava's getting near us."

They all set off downhill, towards the place of their last camp, on the river bank. From time to time they looked back to where the rumbling kept getting louder and louder. Above the ridge formed by the old lava-stream the new one had already appeared. However it did not in the least resemble the wall of fiery-red lava that three of the observers had imagined—Kashtanov, who had some knowledge of those phenomena, being the exception. It was a rampart of boulders of varying sizes, moving forward pushed by some invisible but monstrous force.

The boulders crept slowly onward, bumping against one another with cracking and crunching sounds; some slid down from the ridge, and were replaced by fresh ones, while others rolled a long way down the slope, crashing over the uneven surface of the old lava stream or the boulders which lay upon it. Jets and clouds of white steam burst from the gaps between the boulders forming the rampart, while blue flames darted out, or glowing patches appeared in places, like embers in a dying fire veiled by ashes. But this fire was advancing like a huge, crawling monster, covered with undulating armour of black scales—belching hot breath and poisonous vapour as it came.

Dodging the boulders that were rolling down the hillside, the explorers ran down to the bed of the right-hand headwater of the river, a little above their camping place. They saw an irregular surface with muddy rivulets flowing over it. Without hesitation, the men strode forward, but at their second step they found themselves up to the knees in soft mud. Cries of indignation rang out.

"Hell! Here's a nice mess! You can't drag your feet out of this quagmire. It's like dough!"

Gromeko, who was behind the others and sank in less deeply, managed to extricate his legs from his top-boots; he left the latter in the mud, then, standing on a firm boulder at the edge of the stream, dragged them out, with considerable difficulty. The rest of the explorers stood helplessly stuck, unable to move, like flies on a flypaper.

Meanwhile, the front of the lava stream was steadily advancing and was now only two hundred yards up the slope. The situation of the men stuck in the mud was becoming tragic. There was not a single log or plank at hand, nor even a pole that could be placed on the mud to help them to free their legs.

But Gromeko did not lose his head. He briskly threw a few flat pieces of lava from the river bank in the direction of Papochkin, as being the least heavy of the three. Then he dropped his bag, his gun and some of his clothing and, rolling his trousers up above the knee and stepping across the pieces of lava towards the zoologist, he helped him to free himself of his load. This done, he took him by the armpits and gently lifted him out of the mud. Papochkin was not wearing top-boots but laced up ankle-boots which could not slip off the feet, and so were not left behind in the mud. Next, the two of them built a second path of lava blocks leading from the boulder to Maksheyev, and together they dragged him out, leaving his top-boots. The three men combined to pull out Kashtanov, the tallest and heaviest of them all—also without his top-boots.

Meanwhile the front of the lava stream had advanced nearer, and was already scorching the explorers with its hot breath. There was no time to rescue the deeply-embedded boots, for they had to save themselves from the lava as quickly as possible.

Picking up their belongings, the unfortunate explorers ran down the bank of the stream, looking for a more hopeful spot. But everywhere was the same treacherous grey mud in which they dared not set foot.

Making one fruitless attempt after another they at last approached the site of their camp, where the stream-bed now contained a substantial little lake. There was not much water in it, but the bottom appeared to consist of the same mud, down to an unknown depth. And meanwhile, the lava flood was slowly but steadily descending behind them.

The rattling, rustling and crackling of the rolling boulders and the hissing of the steam did not cease for a moment. They could smell sulphur and chlorine and the heat grew fiercer and fiercer. . . .

Coming to the lake, where the two headwaters of the river merged, the explorers ran across the end of the old lava stream to the bank of the left-hand headwater. But this too was now a strip of swampy mud. There was only one thing to do—to follow their track of the previous day along this stream to the Hermit's Lake—fleeing from the second flood of lava at the risk of an encounter with the first. This stream-bed narrowed between the sheer cliffs of the plateau and the slopes of the volcano, and here they might find a narrow place where it would be possible to make a ford of lava boulders across the stream or even jump over it. They soon found such a spot, but on the far side there were steep high rocks. It was impossible to climb them, or get round them, for their base was covered with the same sticky mud.

Exhausted by running and agitation, the explorers sat down with bent heads on some boulders beside the mud. Death seemed inescapable, either by suffocation in the mud while trying to cross or by being burnt alive on the bank when the flood of lava reached them. Both prospects were equally agonising and, in this desperate situation each of them thought of committing suicide if there was no other way out.

After a short rest, Kashtanov noticed that the lava was advancing more slowly than before. Jumping up, he cried out:

"Let's run as fast as we can up this bank. We'll be able to get past the end of the lava; it's almost stopped moving."

"But if we do get past this lot of lava we'll only run into the one that overwhelmed Hermit's Lake and which will, of course, come down this gully," said Papochkin hopelessly.

"It's our only chance of salvation," Kashtanov insisted. Higher up the stream we may find a ford over the mud at some point where the cliffs on the left bank are accessible. And it's quite probable that the two streams of lava don't merge, so . . ."

"So there should be a fairly wide space between them, free from lava!" exclaimed Maksheyev, finishing the thought.

"That's right, and we can wait in the gap until the surface of the mud has dried enough to bear our weight."

"Hurrah!" cried Gromeko and Papochkin.

They all got up and with a fresh surge of energy strode on

southward up the gully, clambering along their path of the previous day, across the remains of old lava-streams. To their left, a hundred yards away, stretched the front of the lava, from which great heat beat down upon them. But it was moving slowly, and they gradually increased the distance between themselves and the deathly black rampart. Soon they saw that this moving rampart was turning upward, climbing the slope of the volcano. They had succeeded in avoiding it.

"Well, that danger's past!" said Maksheyev, sighing with relief.

The stream-bed narrowed in a number of places so that it would have been quite possible to jump across the mud. But a steep wall barred the way on the opposite side. They must go on. Soon they began to climb to the top of the highest of the congealed lava-streams on the western side of the volcano, beyond which lay the hollow with the lake. When they reached the top they saw that their chances of saving themselves had greatly increased.

This old lava-stream had separated the new lava into two branches and formed a flat hump between them. The explorers sat down comfortably on its crest, from where they could see below them the hollow which the day before had contained a mirror in a green frame, the peaceful lake that has so delighted Papochkin. Now there was neither lake nor palm-trees nor grass, but an expanse of grey mud with isolated puddles of dirty water. From the slope of the volcano the second lava-stream was advancing upon this expanse, and as the hot boulders of lava came into contact with the soft mud a continuous cannonade of small explosions rang out along the rampart's edge, followed by clouds of white steam.

Though there were five or six hundred yards between the explorers and the streams of molten lava, they felt the proximity of this hot mass very forcibly. The temperature was infernal, especially as Pluto was now quite free of clouds and blazed uninterruptedly. As they sat there with nothing to do they found the heat overwhelming, and took off their top clothes. They began to suffer from hunger, thirst and fatigue—for they had had little sleep the previous night, and ever since had been rushing about in a state of excitement.

"Oh dear," complained Papochkin. "If only I could drink a cup of tea! This heat is frightful."

"The heat's frightful, but there's no fuel. What about putting the kettle on the fresh lava?" joked Maksheyev. "It would soon boil there."

"But have we any water?"

"We have a fair amount left," Gromeko reported, after inspecting the container.

"Well, hand it over then, and let's have a bite of something since there's no tea to be had. I'm terribly hungry."

They all sat round in a circle, fetched out the dried fish and ship's biscuit, and ate their meal with gusto, washing it down with water.

"We made a bad mistake this morning and now we're paying for it," said Kashtanov.

"What do you mean?"

"To escape from the torrent of mud, we should have crossed the stream, on to the far bank, at once, instead of going upstream. If we'd done that we should be on the seashore by now, instead of dodging mud and lava."

"That's true. From that bank there was a clear way down to the sea."

"Well, not quite. The double rush of muddy water did, after all, pass down the valley, and probably flooded it."

"And we'd have been trapped there."

"But we could have climbed up to the black desert and got back to the sea across the plateau."

"Yes, we blundered there. When in a great hurry one doesn't foresee all the consequences of one's actions. At the time, the most sensible thing seemed to be to climb up the hillside, away from the rush of water."

"No; certainly people who were well-informed about the behaviour of volcanoes would have judged better than we did which way to go."

"But I think," said Papochkin, "that we made our big mistake yesterday when we stopped overnight at the foot of the volcano, in spite of the signs that an eruption was beginning."

"But that was just why we did stop, to see the eruption!"

"Well, we've seen it! Personally I've had enough to last me a lifetime, and in future I'm going to keep as far away as possible from these restless mountains. I sacrificed my gun to Satan, and to Grumbler . . ."

"To Grumbler, Maksheyev and I sacrificed our boots, and

that's a much worse loss. You've got boots on your feet and yet you're complaining! We shall have to walk barefoot right back to the sea, across the hot stones of the black desert."

"Yes, you're right. I'm best off of anyone, and should keep my mouth shut."

"What are we to do now?"

"What are we to do? The only thing we can do is to get some sleep, if it's possible on these stones."

"Let's try, anyway. But we must take turns to stay awake, to keep an eye on the volcano. It may have some more tricks up its sleeve."

"How long can we sleep?"

"As long as Grumbler lets us."

"At most—but at least, until the mud in the stream-bed dries enough for us to cross it."

And so three of them bedded down as best they could on the boulders of lava while the fourth kept watch over the behaviour of the volcano and the drying of the mud. In spite of the heat given out by the lava-flood and Pluto's rays, the mud was still slowly drifting forward, and only became hard enough to walk over after some six hours.

Gathering up their belongings, the explorers went down to the stream-bed and, one after another safely crossed the muddy surface. Then they began climbing up a cleft in the rock, scrambling from boulder to boulder, foothold to foothold, helping each other up, and in half an hour they had reached the black desert, where they were safe and could breathe freely.

Papochkin turned towards the volcano, took off his cap, bowed and said:

"Farewell forever, old Grumbler! Thanks for your kind hospitality!"

They all smiled. Kashtanov cried:

"Ah, if I had my boots I wouldn't be leaving here."

"Why, what would you do here?"

"I'd go further south across the black desert and see what's behind the volcano."

"Only the same desert—you can see that from where we are."

"It's not only boots we lack, but food as well," observed Maksheyev.

"And there's hardly any water left," added Gromeko, shaking the container.

"You're right. We must hurry back to the shore. But these black stones are frightfully hot. I feel as though I were standing on a red-hot grid-iron. My thick socks are nearly in shreds from running across the lava."

"We'll have to tear up our shirts and wind them round our feet," suggested Maksheyev. "It's quite impossible to walk bare-foot."

While they were talking, he and Kashtanov kept hopping from one foot to another, trying to cool each in turn. Now they took off their shirts, twisted them round their feet, tied them with the slings from their guns and, casting a last glance at the volcano shrouded in black clouds, they gaily strode forward across the desert towards the north. The going was easy: the desert was perfectly flat, being in some places a bare mass of ancient, greenish-black lava, worn smooth by the winds, and in other places strewn with tiny fragments. As in the desert surrounding the volcano Satan, there was not the slightest sign of vegetation. The black plain stretched to the horizon. Above, the sky was clear, and the red sun at the zenith flooded the plain with its beams, which were reflected in the smooth surface making it glitter with millions of little green sparks. The explorers had to shade or screw up their eyes to avoid being dazzled.

They marched north-eastward, towards the lower reaches of the river, where they might find a spot suitable for climbing down from the plateau. After three hours they drew near the edge of the cliff and began looking out for a convenient cleft. The valley, which only the day before had looked like a green oasis, was now completely ruined by the muddy deluge. Trees had been overthrown and bushes torn up and carried away by the flood, and the meadows were covered with mud. All that was left at the foot of the cliffs were occasional scraps of greenery. As they gazed at this scene of devastation, the explorers recalled their intention of shooting some iguanodons in the valley on their way back.

"They've probably fled into the sea."

"Or drowned in the mud."

The latter suggestion proved correct. A little further on the explorers noticed that pterodactyls were circling above the valley, like crows over carrion. As they drew nearer they saw that a gory feast was in progress on the valley bottom. The carcasses of several iguanodons protruded like big mounds from the mud,



Pterodactyls were circling above the valley, like crows over carrion.

and dozens of flying lizards were feeding on them. With their large-toothed beaks the creatures tore at the flesh and internal organs, quarrelling and fighting, driving each other away, flying up into the air then settling again. The screeching and croaking never stopped for a moment.

"There's our game!" said Gromeko, at the sight of this repulsive scene. "What shall we do now?"

"We could shoot down some pterodactyls," suggested Maksheyev.

"After they've been eating carrion? No, thank you!"

"But we've already tried them."

"We didn't know, then, that they ate carrion. And we ate them because there was no other meat to be had, when the ants had stolen our supplies."

"But we haven't any meat now, either."

"There's some dried fish in the boats, and we'll catch some fresh at the mouth of the river."

"You're forgetting that there isn't a river any more," said Kashtanov. "And probably the whole bay is full of mud brought down by that deluge, so that the fish have either been suffocated or swum further out to sea."

"I'm afraid there won't be any fresh water for us, either," remarked Gromeko.

"That's only too likely, since the river's gone."

"And I'm afraid that all our things that we hid in that thicket must be lost. They were near the river and not very high above its level. If the muddy deluge was as fierce here as it was farther up, it may have carried everything out to sea, or, at best, buried it in mud."

This observation of Maksheyev's deeply disturbed them all and they hurried on, forgetting about the pterodactyls. Papochkin managed, however, to get a photograph of the reptiles' banquet.

Not far from the mouth of the valley there was a steep, narrow ravine, down which they made their way. They would have liked to run, so as to reach the sea sooner. But this was impossible. The mud which had overflowed everywhere, though not very thick, was not yet dry enough, and their legs got stuck at every step. It was already plain that the torrent of mud had done its work effectively at the mouth of the river too. The lower reaches had flowed along a narrow corridor between walls of horse-tail

and fern. Now there was a broad clearing through the forest, and the uprooted trees were covered with mud. Even beyond this strip, down which the bulk of the water had rushed, the flood had left its mark: the whole of the forest at the mouth of the valley had been flooded by muddy water, which had left a thick layer of slime behind it.

Wading through this mud, the explorers at last reached the shore of the bay—and gasped. Instead of clear blue water they saw a brown mess, on the surface of which floated leaves, branches, twigs, bushes and whole trunks, swept by the flood out to sea. Maksheyev and Gromeko ran to the thicket where they had hidden their boats and other belongings. They were almost sure that everything had been carried away, for the signs of devastation were to be seen all around, and even the beach beside the river-mouth was covered with a layer of mud.

“Hurrah!” they cried. “It’s all right; come and help us.”

Their belongings had been saved, thanks to the fact that they had been placed in the boats and the latter covered with the tent and the raft and, moreover, firmly fastened to some trees. They all heaved a sigh of relief; then they set to work to dig the boats out and drag them and the other things down to the shore where, at some distance from the estuary, they found a place which was not covered with mud. But as the river had dried up, they had to abandon this spot which had so attracted them the previous day. It was risky to continue their voyage westward, since in that direction the southern shore consisted of bare cliffs with a tableland topped by black desert, and there was no hope of finding fresh water.

“As we have no reserves of water we can’t go west; but we know there is a spring to the east, quite near which we spent the night,” said Gromeko, concluding their debate about which direction they should take.

XLVII

THE VOYAGE BACK

WITHIN an hour the explorers had crossed the bay, now transformed into a muddy pool; they rounded the cape and turned eastward, along the low, monotonous shore with the wall of forest behind it. They all rowed hard, so as to reach fresh water as soon as possible and rest and sleep at last after all the toils and tribulations of the last two days.

This haste did not prevent them, however, from landing and hunting some iguanodons that they had noticed on the beach.

Next day the voyage continued at the same vigorous rate, and by the evening they had reached the sinister spot at the mouth of the Ants' River, near the anthill which they had burned. Here there was a stretch of sand and fresh water; and there were no other suitable camping places ahead.

They stopped and spent the night there, and were not disturbed by any untoward occurrences. They spent next day voyaging eastward through the strait dotted with islands, which joined the eastern and the western seas. This time they kept close to the northern shore, so as to locate the mouth of a river which was considerably larger than the River Maksheyev, though evidently of the same character. Its low banks were covered with dense woods, which stretched to the very edge of the water and did not leave a yard of ground clear enough for landing. They had to eat a cold meal in the boats.

While they were resting after their food, Papochkin suddenly had an idea which he hastened to impart to his companions.

"We're on the northern shore of the sea now, aren't we?" he cried joyfully.

"Why, yes, of course," answered Kashtanov.

"Let's keep to it, then, right up to the mouth of the Maksheyev River. In that way we'll avoid making a dangerous sea-crossing."

"But weren't we going to investigate the southern shore to the east of the point we looked at first?" asked Gromeko.

"Isn't it time for us to be thinking about our journey back to the ice?" the zoologist retorted.

"Why so soon?"

"Because it will take three or four times as long to sail up the river as to sail down it. We shall have to row against the current all the time."

"Well, that's all right; we've plenty of time."

"Not so very much. You see, it's nearly the end of August. No doubt it's eternal summer on the seashores but back there in the north, near the ice, there must be a winter season. If we put off our return journey we'll risk running into the cold weather, and if the river is covered with ice, we'll have to drag ourselves on foot across the snow."

"Without skis or warm clothing!" added Maksheyev.

"That's a very important consideration, of course," said Kashtanov. "But if we spend one more week exploring the southern shore we shall still have enough time for our return journey."

"But there's another consideration, too," Papochkin insisted. "In all our expeditions on the southern shore we bumped into dangers and obstacles connected with ants. There's no doubt that those pernicious insects infest other parts of that shore too. To fight against them we'd have to use up a lot of ammunition, and we've not much left. What we have we should keep for our return journey; we'll need it for hunting and for protecting ourselves against wild beasts."

"And, finally," said Gromeko, supporting him, "we're hardly likely to find anything new on the southern shore in the three or four days we can spare for a further voyage to the east. We know that the sheer cliffs of the tableland stretched a long way in that direction; and when we were at the top of Satan we couldn't see anything to the east but black desert."

"At best we'd only discover another river, with another group of volcanoes at its source, and a few more surprises," added Papochkin, whose misadventures still rankled. "Twice we've escaped almost by a miracle. Is it wise to tempt fate again?"

"I see that I'm in a minority of one," said Kashtanov, not without vexation. "Three of us are for starting back, and their arguments are solid ones. I shall have to yield to the voice of wisdom."

"Shall we keep sailing along the northern shore?" asked Gromeko.

"Why, yes, since we've decided not to explore the southern one."

"Then we must take in fresh water at once, for it's hardly likely that we'll get as far as the Maksheyev River today, and we don't know of any other river nearer than that."

After filling both their containers with water from the mouth of the big river, which they named the Gromeko River, the explorers went on sailing amid the sandbanks and islands of the delta, trying not to lose sight of the northern shore. The latter was as low here as at the mouth of the Maksheyev River, but lacked the strip of sand; the forest and the beds of cane came down to the very edge of the water. Gradually the islands thinned out, and then disappeared altogether, and the shore began to bend away towards the north. On the southern shore opposite this point the area of sand dunes began. In the distance they could see the Satan's cone, whose dense smoke hid the horizon in that direction.

The voyage was enlivened by insects which hovered over the water and over the greenery, and also sometimes by small flying lizards in pursuit of dragon-flies, and the heads of plesiosaurs appearing above the water some way from the shore. Close in to land the water was very shallow, and now and again the oars touched the bottom.

Here and there the green wall of reeds which fringed the forest was broken by broad, well-trodden paths—corridors by which the various lizards of the forest, presumably made their way down to the water.

Before lunchtime next day the explorers reached the mouth of the Maksheyev River. They recognised it easily by the pyramid that they had erected. They spent nearly twenty-four hours here, making their final observations on the seashore, fishing in the estuary and drying their catch, and mending their boats and raft in preparation for the long voyage up the river.

This voyage upstream went rather slowly. They were obliged to ply their oars without a break, allowing very little time for rest, food and sleep. They only covered twenty to twenty-five miles a day, depending on the speed of the current.

The progress was also delayed by adventures with lizards and mammals, both predatory and herbivorous; to conserve their ammunition, the explorers fired only to get fresh meat or to drive off attackers.

During the first weeks of this voyage conditions showed no noticeable change. But when they came to the deciduous forest of the more temperate climate, they found that the leaves on the trees had already turned yellow and fallen and the further north they went the barer the trees became.

The weather changed too. Though Pluto still shone at the zenith, dense clouds often hid its face, a cool north wind blew, and sometimes there was a drizzle of thin autumnal rain. In the intervals when the sky cleared it grew hot again, but the average temperature kept on falling.

Foul weather in the shape of heavy rain with chilling headwinds hindered their progress and even forced them to halt at times. They had to take cover in the tent and to warm themselves over the fire. Having spent several months in a warm, dry climate, the explorers had grown more sensitive to cold and damp.

In the zone inhabited by mammoths, long-haired rhinoceroses, giant reindeer and primitive oxen, winter had already begun. The temperature stayed around freezing-point, rising only rarely, when the sky was clear. But the latter was for most of the time completely shrouded in thick clouds, which occasionally dropped snow. The cold north wind blew. At the same time the water in the river subsided visibly, and its narrow bed was made still narrower by fringes of ice. It remained unfrozen only in mid-stream, thanks to the more rapid flow of the current there. They foresaw that in a day or two they might be forced to give up navigating. Their raft had already had to be abandoned owing to the narrowness of the channel. Heavily-loaded, the boats slowly advanced one behind the other against the rapid current, and covered only ten or fifteen miles a day. And they were still more than sixty miles from the hill where they had left their tent.

A thin layer of snow covered the banks, the trees and the clearings.

XLVIII

THE MYSTERIOUS FOOTPRINT

ONE day after supper Gromeko and Maksheyev went off to fish on a soft sandy slope which showed yellow on the bank against the withered and frozen grass. Maksheyev had cast his line and was watching the float, when suddenly he noticed on the sand, beside the imprint of his boot, the clearly defined mark of a man's bare foot.

"That's queer," he thought. "I haven't taken my boots off, so far as I remember, and it's hardly likely the doctor would have done so either, in such chilly weather."

He bent down to examine the footprint. It had been made by a left foot, bigger than the print of the engineer's own boot, which was no small one. The print was flat; its owner had evidently always walked barefoot. What was most striking, was that all five toes, which were distinctly imprinted in the sand, were very long, and the big toe stood well out from the others. It looked more like the print of an enormous hand with a very long palm.

A little farther on, Maksheyev saw the print of a right foot, but the greater part had been obliterated by the water. Evidently the person who had made these footprints had waded across the river, since there were no prints returning up the slope.

"Mihail Ignatyevich, come here a minute!" cried Maksheyev.

"What's the matter? Wait a moment, I've got a bite!" the botanist answered.

"Leave your fish and come and look at this; I've found something very curious."

"A crab, or a turtle, or what?"

"No—a man's footprint in the sand."

"No!"

Gromeko left his line and ran to join his companion. After examining the print with amazement, he agreed that the foot was a very strange shape.

"Perhaps an ape has passed this way?" he suggested.

"Up here, in this sub-polar tract, among larches and birch-trees?"

"Who knows? If mammoths and rhinoceroses, whose near relations live nowadays in warm climates on earth—if they can live here in northern forests and tundra, why shouldn't apes have adapted themselves to this climate?"

"Maybe you're right. We must fetch the zoologist and the geologist, they'll be able to judge better."

"You catch your fish while I go and get them."

Gromeko floated in the canoe down to the camp-site and fetched his comrades.

"It must be a huge ape," suggested the geologist.

"No, I think it's more probably an ape-like man," said the zoologist. "See, he walked on his feet, without using his hands. An ape going down a fairly steep slope into the water would probably have leaned on his hands as well; but there are no hand-marks to be seen."

A close inspection of the locality revealed a path on each bank of the river, and a shallow ford across it. The footprints were not so clear on the path, but the distance between them indicated that the creature was not less than six feet tall.

"What have you discovered?" asked Maksheyev, when they came up to him. While they studied the footprints, he and Gromeko had gone back to their fishing.

"What's most likely is that these tracks were left by an ape-like man following a well-trodden track to a shallow ford, leading across the river," said Kashtanov.

"Then men have penetrated into Plutonia before us?"

"And these men are walking barefoot, in the snow, and calmly wading through icy water!" exclaimed the botanist.

"They must be savages, surely? If so, it's not surprising that the shape of their feet is hardly different from that of an ape."

"It wouldn't be pleasant to run into them. They're probably cannibals."

"Well, the ants didn't beat us, though they hindered our work. And we'll come to an understanding with savages, too, somehow or other."

They now had to be specially careful not to be caught unawares by an attack. When they rested they took turns to mount guard, and during the whole of the following day they kept a sharp look-out all round.

But two days later their voyage came to an end. A prolonged

snow-storm blew from the north and the river froze over and became covered with a six-inch layer of snow.

Not wanting to abandon their boats nor carry their belongings on their backs, they decided to make some runners, place the boats filled with baggage on them, and drag these improvised sledges along the stream-bed, where there were no bushes or trees to block the way. But it was not easy to walk without skis across the fresh, loose snow, dragging heavily-loaded sledges, and they only covered about ten miles a day. Pluto barely showed himself from behind the thick veil of clouds, and the temperature went down to 23 or even 20. It was very cold in their thin tent and summer clothes, and when they rested they took turns to stay awake and keep up the fire at the entrance to the tent. In the battle with the frost and the snow they quite forgot the primitive men. In any case, they came upon no more tracks. All living things had apparently migrated southward, and the scanty trees, shrouded in white, were silent in their winter sleep.

It was only on the eighth day of their sledge journey that they at last came to the end of the forest; white mounds could be seen on the horizon showing where the ice began, and only just visible against this background was one dark dot—the tent on the hill, which almost merged with the level tundra.

They had about six miles more of heavy going, then they would be reunited with their comrades and enjoy a rest in the warm felt tent, after their many weeks of wandering. After three hours they were only half a mile away from it, and every minute expected to hear the dogs barking and to see the men running out of the tent to meet them with sledges and skis. But there was no one to be seen, no dogs barked, and the tent, half buried in snow, stood black and solitary, as though deserted by its inhabitants. Alarming questions arose in the explorers' minds and they put them to each other.

"Are they really spending the whole day asleep?"

"Why can't we see or hear the dogs?"

"Can anything have happened?"

Straining every muscle, the explorers speeded up their progress across the deep, loose snow of the plain, in which their legs sunk almost up to the knees.

Now the hill was quite near, but everything on it was silent and deserted as before. The explorers stopped at the foot and shouted in chorus:



The only answer was sepulchral silence.

"Hey, Borovoy! Igolkin! Get up and come to meet us!"

They repeated their call again and again, but the only answer was sepulchral silence. They became seriously worried.

"If our comrades aren't dead, the only explanation of their silence can be that they've gone off somewhere with the sledge to hunt big game," said Maksheyev. "Especially as there are no dogs here."

"But we've not seen any game at all for a whole week," Papochkin objected.

"They must have gone farther south, then."

"Perhaps they've gone to look for us, because we were away for so long?" suggested Gromeko. "When the cold weather began and the snow started falling they must have remembered that we had gone off in summer clothing and without our skis."

"That's not very likely—they knew what river we were travelling along and couldn't have missed us on it," observed Kashtanov.

"I think we'll find the answer to the riddle inside the tent," said Maksheyev. "But first let's go right round the hill and make sure there are no tracks that we might accidentally trample over."

Leaving their sledges at the foot of the hill, the four men walked round it, carefully examining the surface of the snow. But there were no tracks to be seen, neither fresh nor old, and it was clear that nobody had either climbed the hill or come down from it since the snow had covered the ground.

XLIX

IN THE ABANDONED TENT

THE thick felt door-flap of the tent, facing south, was closed and fastened from the outside: consequently, the tent must be empty. The explorers raised the flap and went in. The tent had a lived-in look about it. The expedition's boxes, containing instruments, specimens and the more valuable property,

were stacked against the rear wall. Guns, cartridge-belts and clothes belonging to their comrades were hanging up, and their sleeping bags were rolled against the side walls. The blackened remains of a fire lay in the middle of the tent and there was even a kettle hanging from a tripod over it; beside the fire lay a heap of firewood and twigs. Everything looked as though their comrades had only recently gone out.

At the sight of all this the returned explorers became still more alarmed. Their comrades had not left to hunt or on an expedition, for both their guns and sleeping bags were still in the tent. They could only suppose that some enemies—either wild beasts or men—had fallen upon them unawares somewhere near the tent; for instance, along the edge of the glacier, or in the tundra. And the dogs, deprived of their masters and tormented by hunger, had either perished or run away. But if some savage horde had descended on their comrades why had they not ransacked the tent while they were about it?

A more attentive inspection of the things in the tent revealed that the kettle, the guns and all the rest were covered with dust. Maksheyev lifted the lid of the kettle; the remains of the tea at the bottom of it were covered with mould. It was plain that their friends had left the tent some considerable time ago.

"What's this?" demanded Kashtanov, pointing to a strange wooden object standing on one of the boxes. They all approached the box. On it was a model of a mammoth, very crudely carved out of a piece of wood. It was covered with brown smears and a layer of fat, so that it was disgusting to touch.

"Has boredom driven Igolkin to take up sculpture?" suggested Papochkin.

"No," said Maksheyev, "this must be an idol. It's been smeared with the blood and fat of slain animals as a sacrificial offering. Our comrades presumably found it somewhere."

"Yes, this find, together with those footprints in the sand, seem to prove that some sort of primitive men live near here," observed Kashtanov.

"And they've either killed or carried off our comrades," cried Gromeko.

"Why didn't they make away with their belongings as well?"

Maksheyev picked up the wooden figure to have a closer look. To the general amazement, there were a couple of pieces of

paper neatly folded beneath it. Kashtanov quickly unfolded them and read their contents aloud.

The first paper, dated September 25th, read as follows:

We have been captured by savages who suddenly appeared in the tundra. They caught us unawares two weeks ago, when we were checking our stores in the glacier, unarmed, and carried us off with them into the forest. They didn't touch the tent or the stores but would not let us take anything with us. The dogs ran after us. They do not ill-treat us but feed us and even honour us, probably regarding us as magicians or gods of some kind, but they won't let us go. They guard us strictly and have taken away our boots and nearly all our clothing. They themselves go about quite naked, live in huts made of poles and skins, do not know fire, and eat raw flesh. Their weapons are made of bone and wood—spears, bows and arrows, and knives. There are more than a hundred in the tribe, but women predominate; both men and women take part in hunting. There are not many of the men, and they are puny creatures, but the women are big and strong. Their bodies are covered with fairly thick hair and they are altogether very like large apes without tails, but they can speak and we have begun to understand what they say. We have learned that they regard our tent as some sort of dwelling of the gods, and go there to make obeisances. We have taken advantage of this to send a note as a sacrifice to the god. They have promised to place it in the tent. They took us away in a south-easterly direction about thirty or forty miles down the river which you and we crossed after the mammoth that we killed. We think you may be able to free us without shedding blood, if you appear in the shape of gods. Bring us some warm clothes, matches and tobacco. The summer passed satisfactorily and there is plenty of stuff in the store.

Borovoy, Igolkin.

The second sheet of paper was dated November 2nd.

It has grown cold, and often snows. The savages are getting ready to migrate further south, where it's warmer. We have made a fire and are using it to cook meat and keep ourselves warm. But the savages are afraid of it, and show us even greater respect now. It is the women who are mainly responsible for holding us prisoner—they like us because we are handsomer and stronger than the men of their tribe. The men would willingly help us to escape. We are sending our last

message, as the savages will not be going to the tent again. But on our way south, which will probably be along the river, we will leave messages at each place where we halt for the night, or along the road between halts, sticking them on bushes, so that you'll be able to follow us. If we don't manage to escape by cunning, with the aid of the men, let us know you are near by firing shots. Advance openly, firing volleys into the air, so as to startle the savages and force them to submit to our will. If the worst comes to the worst, shoot at a few of the women. We are not downhearted or frightened, but we are feeling the cold and the effect of a monotonous meat diet. We are worried about you, and wonder whether you have returned and whether your expedition was successful.

Borovoy, Igolkin.

"They're alive!" cried Gromeko.

"We must hurry to rescue them: they've been captive for nearly three months, it's December 5th already," said Gromeko, glancing at his diary.

"They write that the savages took nothing away from here," said Maksheyev. "So the sledges and the skis must be in the glacier, along with the reserves of food; we'd better dig an entrance into the storehouse and start getting ready to go."

"Yes, everything's in order in the tent, so the storehouse should be intact too, provided that the door wasn't left open for the dogs to drag stuff out," said Papochkin.

After their hard journey across the snow, spending the nights under canvas with nothing to eat but meat and biscuits, a warm felt tent and stores of tinned food of various kinds made life seem much brighter to the explorers. They decided to rest a few days and prepare for another journey which might last several weeks, depending on how far the primitive men had migrated.

The whole of the hill round the tent was covered with deep snow. Everything was intact in the store-houses. They took out the sledges and the skis to inspect them and do any necessary repairs. The large storehouse had been closed with a proper, permanent door; so that wild beasts had not been able to take anything, in spite of the absence of the men and the dogs. The canny hermits had prepared a quantity of smoked meat to tide them over the winter, and this now came in very handy, since it relieved their comrades of the need to spend time in hunting.

A little distance away on the hill was a small meteorological

cabin that Borovoy had set up. The instruments were in good condition. In the tent they found the meteorological record he had kept, from which they learned what the climate had been in the tundra in the second half of the summer and the beginning of the autumn.

They decided to take the tent with them, and to leave all the superfluous things in the storehouse; they locked it up and blocked the entrance with snow so as to hide its presence completely from any unwelcome visitors.

As decided, they got two sledges ready for the journey, with six pairs of skis, food for a month, warm clothing, and sleeping bags. They also took sugar, sweets, knives, needles, thread, beads and rings as gifts for the savages, should the latter be ready to hand over their prisoners voluntarily. Just in case, they also took some spirits and some brandy, to make the guards drunk, should that prove necessary.

L

ON THEIR COMRADES' TRAIL

AFTER resting for three days on the hill they set forth again, first heading south-east to the river across which Kashtanov and Papochkin first hunted the mammoths, and then down this river.

On the second day of their journey they found the clearing on the left bank of the river where the settlement of the primitive men had been; nothing was left of it but the skeletons of a dozen huts made of poles and arranged in the shape of cones, like the *chooms* of the Hanti and Evenki in Asia.

A piece of paper was fixed to one of the poles. It bore these words:

We lived here as prisoners until the migration southward began. Today the tribe is leaving. On our way perhaps we shall be able to es ...'

The end of the note had evidently been torn off.

They decided to continue to travel down the river, carefully examining the clearings every ten miles; this they estimated would be the probable distance covered daily by the tribe, which would progress slowly, burdened as they would be with all their household goods and chattels. A note from their captive comrades might have been left at the edge of any of these clearings.

And indeed, towards evening on the same day, they found themselves in a large clearing where there was a note left on a bush, fastened by a bit of thread to a twig. It read:

We are covering a dozen miles a day, sometimes following paths that run beside the river and sometimes walking in the river itself, which is very cold and in some places comes up above our knees. This means nothing to these people. They've given us back part of our clothing, but at nights they take it away again and supply us with animal skins to keep out the cold. They don't build huts while they are migrating, but sleep under the bushes. We are surviving thanks to the fire which we take turns to maintain all the time when we stop anywhere.

Borovoy.

The next day they covered twenty-five miles but did not find any notes; perhaps they had been blown away by the wind, or shaken off by passing animals. The next day, after their lunch-halt, they again found a note, which read thus:

The savages are removing our notes from the bushes when they notice them, and keeping them as talismans. They think that we leave them as offerings to the evil spirit who brings the winter cold and snow. So we shall be able to leave notes only in exceptional circumstances, but when we are travelling down the river itself we shall stick blank pieces of paper on the bushes to show we have passed that way. When you reach a spot where there is no snow and the river is not frozen any more, be particularly vigilant. We think that the tribe will halt there for some time.

Borovoy.

Another six days passed; from time to time they found a note with a few words on it, but more often blank pieces of paper, stuck on the bushes beside the river; on the tenth day of their

journey the layer of snow grew very thin and the ice on the river sometimes cracked under their feet. The temperature stayed at only one or two degrees below freezing point. On the following day they had to leave the river, as the ice had become too thin, and in places large polynias had appeared. The explorers found and followed a path, which wound now through the woods and now along the bank of the river. By the end of their day's march the layer of snow was not more than an inch and a half thick, and there was ice on the river only near the banks.

At last, on the twelfth day of their march, only small snow-drifts were left under the bushes and in the woods, so that they had to drag their sledge across beds of fallen leaves that covered the path. Before the lunch halt they again found a note, informing them that at a distance of one day's march they would find a large clearing, where the tribe intended to spend the winter if the snow did not drive them further south.

Now they had to redouble their vigilance for fear of stumbling into some of the wild men patrolling the approaches to their settlement; one of the explorers, accompanied by General, went ahead as scout.

They spent the night in a small clearing near the river. After supper Maksheyev and Kashtanov went on to spy out the land. After a couple of miles or so they heard a hubbub, with occasional distinct shouts somewhere ahead of them. They crept cautiously to the verge of a large clearing. On the far side of this they saw the settlement of the primitive men.

It consisted of a dozen conical huts made of poles covered with the skins of animals and arranged in a circle. There were small gaps between the huts and the entrances faced inwards. In the centre of the circle was a thirteenth hut of smaller size beside which a fire was blazing. There could be no doubt that this was the abode of their captive comrades. Maksheyev deduced from the size of the remaining huts that the tribe comprised about a hundred adults.

In the circle amid the huts were a number of children, running about most of the time on all fours and looking like dark, tail-less apes. They were playing, jumping, quarrelling and fighting, uttering shrill squeals. A grown man was squatting on his haunches at the entrance to one of the huts; he too looked like an ape. Through their field-glasses the explorers could discern

that his body was covered with dark hair. His face resembled that of an Australian aborigine, but had an even more prominent jaw and a very low forehead. His face was sallow and brownish in colour; a small beard showed black under his chin, confirming that he was a man.

Soon a second person emerged from the same hut, giving the first one a knee-blow in the back to make him get out of the way. The squatting man bounded forward and sprang to his feet, so that the two were now both standing. The second savage was taller and considerably broader across the shoulders and hips, so that the first seemed by comparison a mere youth, slight of build. The face of the second savage was the less ugly of the two; hair longer than the first one's fell shaggily on to this creature's shoulders. The body was less thickly covered with hair than that of the first savage, especially on the breast, the shape of which showed that this was a female.

The woman advanced across the circle towards the central hut. She walked leaning forward a little and waddling. Her arms hung down, and reached almost to her knees; the muscles of her arms and legs were strongly developed. As she drew near the hut where the prisoners were, she fell on her knees before the fire, stretched out her hands in a gesture of prayer, and then crawled on all fours up to the hut.

"She's paying a visit to our comrades!" said Kashtanov.

"Shall we take advantage of the village being deserted to let them know we're near?" suggested Maksheyev.

"How? We can't get to them without being spotted."

"Let's fire a shot or two in the woods; they'll realise it's us, as they themselves suggested this signal."

"But won't that alarm the savages?"

"They've never heard of fire-arms and won't realise what's happening."

"But won't they rush out and start looking for us?"

"I don't think so. They'll be frightened and won't dare."

"Well, all right, let's see what happens!"

The explorers withdrew a little way into the wood and fired two consecutive shots, then returned to their observation post at the edge of the clearing.

The village was in a state of alarm. Several adults, mostly women, and children of all ages now stood beside each hut. They were all jabbering and looking around to see where the

unfamiliar noises had come from. Beside the central hut, by the fire, stood the prisoners. They were naked to the waist and wore only the tattered remains of their breeches; their skins were a deep bronze, their hair unkempt, and long beards adorned their faces. They too were looking towards the edge of the clearing, and their faces expressed delighted surprise.

Suddenly the two prisoners, evidently by previous agreement, turned in the direction of the shot and raised their arms. At once all the savages fell on their knees, their faces to the ground. Silence reigned. Then Igolkin drew himself up, made a trumpet of his hands and, turning towards the edge of the wood, shouted:

"Nearly all the men of the tribe went off this morning to hunt. Tomorrow the women will go too, to help them cut up and bring back the game they've killed. Only the old men and children will be left. Come and rescue us then. Bring us linen and clothes. Is everything all right with you? Have you all come back? Show that you've understood me by firing one more shot, if everything's all right—two, if there's anything wrong."

Maksheyev at once crawled back a little and fired again. At the sound of the shot Igolkin once more raised his arms, and the savages, who had got to their feet while he was shouting and were gazing at him in amazement, again fell on their faces.

After letting them stay there for a bit, Igolkin turned and, facing the fire, burst into a cheerful sea-shanty. The savages crawled nearer and formed a circle round the fire, uttering exclamations of astonishment. Evidently their prisoners had done nothing like this before.

Maksheyev counted about fifty adults, most of whom were women. There were a great many more youths and children of various ages. These stood or sat outside the circle of adults, and from their faces it was plain that Igolkin's singing gave them much pleasure, whereas the adults were thunderstruck and even a little frightened by it.

After singing for about ten minutes, Igolkin again raised his arms, then he and Borovoy, who had remained motionless by the fire during the singing, went back into their hut. The audience dispersed to their homes, except for two women who went up to the prisoners' hut and sat down outside it, doubtless with the intention of guarding them while they slept.



Igolkin burst into a cheerful sea-shanty.

The village soon grew quiet, except for the crackling of the fire as it burned low in the deserted circle.

Kashtanov and Maksheyev returned to their companions and told them all they had seen and heard. Together they discussed plans for rescuing their comrades.

LI

LIBERATING THE PRISONERS

AFTER having a good sleep, the explorers packed their belongings on the sledge and got ready for an immediate departure. Then they made their way towards the savages' village, taking with them clothing and footwear for the prisoners, their guns, and parcels of gifts for the savages. On approaching the clearing they heard shouts and the barking of dogs from that direction. The savages had evidently not left yet, so the explorers approached the edge of the wood stealthily and hid behind the bushes to watch.

They saw that the whole settlement was astir. The circle formed by the huts was full of hunters preparing to go forth. Women and men were bringing spears, javelins, scrapers, bunches of thongs out of their dwellings. Children were scurrying about amongst them, all over the place, touching the weapons, getting cuffed, squealing and howling. The youths were testing the javelins, examining the spears and trying their points by pretending to poke each other with them. About fifteen dogs, which were recognisable as those belonging to the expedition (though they were now half-wild), were kept outside the circle, away from the huts; they were apparently waiting to accompany the hunters, and meanwhile they scrapped and fought among themselves.

At last all the weapons were assembled, and the adults, armed with spears, moved off in a mob towards the east. Behind them followed the youths, carrying the javelins, knives and thongs; their role was evidently that of armour-bearers and porters for

carrying home the spoil. The children ran behind and beside the column, some on two legs, some on all fours, screeching and shouting. The dogs followed at a distance. At the edge of the clearing the children fell behind and turned back, while the mob of hunters, not less than fifty in all, formed into single file along the path and were gradually lost to view in the wood.

The only adult males now left in the village were some old men who were busy tidying up the huts and shaking out and airing the skins which served as bedding. Bent old women came out from some of the huts and sat in the doorways; tiny children crawled about, and infants were carried out and laid down on the skins outside the dwellings.

Only three adult women now remained stationed beside the hut where the prisoners were, evidently acting as guards. One of them was busy cutting skins with a bone knife on a thong; another was using a similar knife to whittle a small stick into an arrow, and a third was chopping up stout bones in order to use the sharp fragments as tips for spears and arrows.

Soon Igolkin emerged from the hut, half-naked as he had been the day before; he threw some wood on the fire and sat down beside the women. Chatting with them about something, he pulled out his big sailor's knife and began helping them to cut thongs. With his aid the work went a good deal faster. Then Borovoy appeared looking towards the direction from which his comrades' shots had rung out the previous day.

The watchers in the bushes could not help smiling at this scene of peaceful collaboration between a twentieth-century sailor and people of the Stone Age. They felt confident that, in view of the few people left behind and their primitive arms, they would be able successfully to liberate their comrades, either peaceably or by force. But they must wait another hour or two, to let the hunters get sufficiently far away not to hear voices calling, or shots, nor to be quickly overtaken and brought back by the women on guard.

The children who had accompanied the hunters when they set off, gradually returned and began playing various games. They wrestled, turned somersaults and fought, and some of the older ones among them threw javelins into the air or into the roofing of the huts.

Igolkin having finished cutting up the skins, went into his hut and fetched out a piece of meat, which he sliced into small pieces



. . . he pulled out his big sailor's knife and began helping them to cut thongs.

and skewered on sticks sharpened to serve as arrows. These sticks he thrust into the ground beside the fire, to grill the shashlik thus prepared. Evidently the prisoners had not breakfasted yet and were going to have a good feed before their escape. When the meat was cooked the two sat down near the fire and began to tuck in to the shashlik. From time to time Igolkin would offer a piece of meat to one or other of the women working near the fire, but they laughed and turned their heads away. Then one of them fetched a large piece of raw meat from her hut and the women began eating this, using their bone knives to cut long, thin strips which they gave to the children who came running up to them.

When breakfast was over, the men lying in ambush looked at their watches and saw that enough time had elapsed.

They emerged from the wood, lined up, and, lifting their guns and firing blanks one after the other into the air, advanced at a rapid pace upon the huts.

At the first shots silence fell in the village. Those who were seated, jumped up, and those who were on their feet remained rooted to the spot, turning their faces towards the advancing line of men who made such strange noises, like thunder. When the explorers entered the circle of huts, the savages prostrated themselves on the ground before them in silence, only the very small children howling with fear.

Going up to the hut where the prisoners lived and handing them their clothes and guns, the explorers went on firing one after another while Igolkin and Borovoy got dressed. Maksheyev said to the sailor:

"Explain to them that you have stayed with them long enough and that some still mightier magicians have come for you. In return for the hospitality they have shown you, the magicians have brought gifts by which they may always remember the strange intruders from the land of eternal ice. Tell them that they must not dare to follow us, or they will be severely punished. Tell them that the gods of the ice can not only make thunder, but lightning too, to strike down the disobedient."

When Igolkin and Borovoy had dressed and come out of the tent, their comrades stopped shooting, and the sailor, whose sociable nature had enabled him to master the savages' language, delivered a speech to the prostrate creatures, repeating the gist

of what Maksheyev had said. But at the end he added, turning to the three women who had been guarding them:

"Hand over these gifts to the elders when they return from the hunt and let them divide them among you. We are leaving you the fire, which you can now use; but do not ever let it die—feed it as we used to feed it. And again I command you—do not pursue us. We are going away to the land of eternal ice, and when the warm weather returns we shall come back to you."

When he had concluded and placed the parcels of gifts at the entrance to their hut, all six, again firing in turn into the air, crossed the circle between the prostrate savages, who did not dare to stir, and disappeared into the forest.

They stopped for a moment at the edge to see what the savages would do. The latter, at the cessation of the shooting, got up from the ground and talked quietly to each other, evidently discussing the extraordinary incident. Some crowded round the fire that had been handed over to them and stared at the flames, now deprived of a master, as though these could explain what had happened. Soon two of the women guards, arming themselves with spears, ran off in the direction in which the tribe had gone, probably to tell them of the incident. The third woman stayed by the prisoners' hut, presumably to prevent the children and youths from stealing the gifts, which she herself dared not touch.

When they reached the sledges that they had left in the wood, the explorers set off towards the north, on their return journey. They had to drag the sledges along a narrow path covered with fallen leaves.

As they drew away from the village Igolkin from time to time uttered a shrill whistle which the dogs knew. The latter had remained near the tribe all this time, obedient to this whistle of Igolkin's. Igolkin fed them with scraps, but the dogs became very wild, for the primitive men were afraid of them and would not let them get near the huts. Some of them had perished fighting various wild beasts, others had gone off hunting with the tribe, and only five dogs who had remained near the village, now came running up in answer to the sailor's whistle. They followed the sledges at some distance, but would not let themselves be touched, and snapped at General when he bounded up to them. The dogs had to be tamed by being fed for a few days before a team could be made up for even one sledge.

After the explorers had walked for twelve hours and covered thirty-odd miles, they halted at last for the night, confident that they would not be overtaken now.

LII

ATTACKED BY PRIMITIVE MEN

THEY had stopped for the night in a large clearing, pitching the tent in the middle as a safeguard against possible surprise attack from behind the bushes. They took turns to stay awake on guard. In addition, the dogs apparently recognised the tent and lay down in the snow not far from it; General would still not let them come right up to the tent.

While Kashtanov was on guard General took fright, growled, then began barking uninterruptedly. Kashtanov noticed that all round the clearing the bushes were stirring and rustling gently. He at once aroused his comrades, who leapt to arms.

Realising that their intended surprise attack had not come off, the savages now stepped out from the woods all round the clearing and began converging on the tent, slowly and irresolutely. They were women, armed with spears and with knives between their teeth. Behind them were girls holding javelins. But they could not bring themselves to use their weapons; apparently they hoped to capture the magicians with their bare hands, as they had done the first time, so as to make them return to the village. Igolkin restrained his companion from firing at once, as he proposed to parley with the women; in any case he urged that one barrel of each gun should be loaded with small shot instead of with a bullet.

"Some small shot in the legs should do the trick with them," he said. "And if it doesn't, which I very much doubt, well, then we can let fly with the bullets."

When the women were about thirty paces off, Igolkin waved his arms and shouted:

"Stop! Listen! I forbade you to follow us. You have not obeyed

me. Our arrows of fire are ready and whoever dares to come nearer will be smitten by them! Go back!"

The savages stopped in their tracks, listened to the sailor's words and conferred among themselves. Then one of the women shouted something, the rest of them waving their hands in sign of concurrence.

"They invite us two to return to them; the tribe can't live without us, they say. The others may go," Igolkin interpreted. Then he bawled back:

"Magicians cannot live long among men. We are going back to spend the winter in our huts in the great icefields, but we will return in the spring. Now go away, quickly!"

But some of the women moved a few paces forward, and one of the armour-bearers, with the recklessness of youth, hurled a javelin, which flew past Kashtanov's right ear and stuck in the tent.

"Well, there's no help for it, we'll have to shoot, since they're getting bolder," cried Borovoy. "Small shot in the legs, in the parts of the circle where the crowd's thickest. One, two, three!"

Six reports rang out, and in response women in various parts of the circle shrieked and howled as they were wounded. Turning about, they all rushed back into the woods; many were limping and left drops of blood on the snow. The very girl who had hurled the javelin at Kashtanov fell after taking a few steps, and remained lying motionless.

"Well, what next?" demanded Gromeko, when the last of the fleeing women had disappeared into the bushes. "Are we to expect another attack, or won't they dare?"

"I think they've had enough," said Igolkin. "In any case, let's get inside, out of the way of any crazy girl's javelin."

This precaution proved unnecessary. The women ran further and further away, howling as they went, and soon all was quiet. The dogs stopped barking and went up to the wounded girl, greedily licking the warm blood. Igolkin, followed by the rest, also ran up to her and drove off the half-wild dogs.

When they examined the injured girl the explorers found that she had only one wound, in the right thigh, but from this the blood was flowing copiously.

"That's queer; small shot can't inflict a wound like that," said Papochkin.

"One of us must have discharged the barrel with a bullet in it, by mistake."

"It was I who fired at her," confessed Kashtanov.

"The poor girl's alive," said Gromeko, after examining her. "She's only fainted from fear and pain. The bullet passed through the soft part of the leg, without touching the bone, but it's torn a muscle badly."

"What are we to do with her? The others have all fled."

"We'll have to take her along with us as a captive. And when she gets better we'll let her go."

"What, release her?" objected Papochkin. "Not on your life! We'll carry her off to the *Pole Star* as a magnificent specimen of primitive man, close to the apes. What a boon she'll be for the anthropologists!"

Gromeko went back to the tent to get material for bandages, stanching the blood and tied up the wound. While he was doing this the girl opened her eyes. Seeing herself surrounded by the magicians, she trembled all over with fear.

She was not tall, but well-made, her muscles powerful and her breasts and buttocks less massive than those of the fully-grown women. Her body was covered behind with short but rather thick black hair. There was none on her face, the palms of her hands or the soles of her feet. Her head was covered with slightly wavy hair of moderate length. The shape of her foot was midway between a human being's and an ape's, with highly developed toes and the big toe standing out from the rest.

Looking into the girl's face, Borovoy exclaimed.

"Why, it's my friend, Katu."

"Can you tell them apart?" cried Kashtanov. "They all look alike to me."

"That's only at first sight; if you look at them carefully, there are differences. We got to know quite a lot of them by name, especially the youngsters and the children. Katu often brought me meat, roots and all sorts of tit-bits by her standards, to show me her favour."

"That's why she dared to hurl a javelin at those who had kidnapped her darling," laughed Maksheyev.

"Yes, an inch or so more to the left, and I'd be short of an eye," said Kashtanov.

After they had bandaged her up, they were going to carry Katu into the tent, but she began howling and struggling to



She began howling and struggling to escape.

escape. Igolkin made out that she was asking to be left to die where she was and not to be taken into the "hut" to be eaten.

"What does she mean, 'to be eaten'?" demanded Gromeko, in surprise. "Are they cannibals, then?"

"Yes; they calmly eat up those who are killed or badly wounded in hunting, or in battle."

"Reassure her, then: tell her we don't mean to eat her but are putting her in the tent so that she can sleep. And when she's better we'll let her go back to her own people."

With some difficulty, the sailor convinced the girl; Borovoy held her hand and she calmed down and let herself be carried to the tent, where they laid her on the bed and she fell asleep, still holding Borovoy's hand.

The time assigned for resting had passed and they prepared to set off again. They made up the fire, put the kettles on, and had breakfast. When Igolkin went out of the tent to fill the kettles with snow he noticed that dogs were still wandering about at the edge of the wood. They had evidently come with the savages and had stayed behind when the latter fled. Perhaps the sight of the tent reminded them of the tasty dried fish which they had once eaten, and they began to remember their former masters. Twelve more dogs came running to the sailor's whistle, so that, with General and the first five who had attached themselves to the explorers, they could find teams of a sort for all three sledges.

"What shall we feed them on?" asked Igolkin. "All we need is food to keep them near the tent and tame them."

"We took enough food for a month," said Gromeko. "In seven or eight days, though, we'll be back at the hill. So we have a stock of ham we can spare them."

"We needn't give them much," added Borovoy. "If their bellies are empty they'll run after us in the hope of getting dinner and supper."

After breakfast they threw the dogs the scraps, the bones and a piece of meat for each one, and then set about packing up. On one sledge they laid Katu, with the felt and poles of the tent, and on the second everything else. There was snow enough for them to use their skis, so that, in spite of their increased load, they could progress faster than the previous day. When the party started out and Katu perceived that they were taking her not towards her tribe's village, but in the opposite direction, she screamed, jumped off the sledge and began to run, but after

going a few steps she fell down. When they gathered round her and tried to put her back on the sledge she resisted them, striking out with her fists and trying to bite.

She had evidently understood Igolkin to mean that they would carry her back to the village and there release her, but instead the magicians were trying to take her back with them to the great icefields. They had to tie her hands and fasten her to the sledge to prevent her again attempting to escape. Poor Katu was trembling with fear and sobbing her heart out in the certainty that she would be devoured.

That afternoon they travelled along the river bed; here the snow lay less thick and had been condensed by the wind, so that the sledges and skis did not sink in as deeply as on the path through the woods. Progress was thus a good deal more rapid, and by the end of the day they had covered another thirty miles.

They took turns to stand guard that night, but all was quiet. Katu had refused food throughout the day, and during the night they had to keep her tied up, under observation by the sentry. At the sight of the gleaming knives with which the white wizards sliced the ham for dinner and supper she trembled all over, clearly expecting to be cut up at any moment too.

Their journey back to the north passed in this way. On the eighth day they were in the tundra, and reached the hill by lunchtime. Katu gradually became reconciled and accustomed to the magicians, and began to take raw food. But she turned away in disgust from anything cooked or fried. They had untied her hands on the third day and her legs on the fifth, after she had promised not to run away.

LIII

LIFE IN CAPTIVITY

DURING the journey Igolkin and Borovoy told the story of their life among the primitive men, and Kashtanov wrote it down.

The day that the expedition set off south, Igolkin and Borovoy, left in the tent, began constructing a meteorological cabin where they could set up their instruments, and a solid door for the storehouse in the ice, to protect it both against their own dogs and possible wild beasts. When they had finished doing this they dug another gallery in the ice of the hill, lower down the slope; the purpose of this was to provide the dogs with a refuge from the ever-increasing heat, which was forcing the animals to run off to the edge of the ice-field, now gradually retreating northward. Until these urgent tasks had been finished they only rarely went hunting, to keep a steady supply of food; but afterwards they hunted every day, so as to build up a stock of meat for the winter—some in dried form, for the dogs, and some smoked, for the human members of the expedition. They always returned from the forest with their sledge well loaded with firewood, so that they gradually accumulated a stock of fuel against the cold season to come.

They hunted mammoths, rhinoceroses, primitive and musk-oxen, and gigantic reindeer. They also shot down geese, ducks and other birds on the rivers and in the tundra, and lived mainly on these, while they dried or smoked the flesh of the large animals. There was more than enough to do, and they were so busy that they often missed their sleep. Various adventures befell them during their hunting trips, but all ended happily.

During the first period after the departure of their comrades to the south the weather had kept improving, the clouds frequently dispersed and Pluto shone for several hours on end, so that the temperature rose to 68 in the shade, and full summer burst upon the tundra. But by the middle of August the decline towards autumn had begun. Pluto was often covered in clouds, sometimes rain fell, and fog rose from the tundra.

The temperature gradually got lower, and at the beginning of September, when fierce north winds blew, it sometimes dropped to freezing-point. The leaves turned yellow, and by the middle of September the whole tundra had lost its green summer dress and become bare and brown. Occasionally there were falls of snow.

Getting ready for winter, Igolkin and Borovoy inspected all their stocks of food, tins and other things in the storehouse, and transferred some of them to the tent. On the second day of this work they had just closed the storehouse and were returning to

the tent for their mid-day meal, when they were suddenly attacked by the savages, who had stolen up round the hill. Borovoy and Igolkin, never imagining that there might be men in Plutonia, had no weapons on them but knives, whereas the attackers were armed with spears, knives and bows and arrows; resistance was thus impossible. However, the savages, after examining the white men, their tent and their meteorological cabin, treated them with respect and took them away to their village.

The latter turned out to be not far off—six miles or so from the tent, in a little wood. Later the prisoners learnt that the tribe had migrated there from the east only the previous day. When they had brought their prisoners to the village, the savages had a long debate on what to do with them; the men proposed to sacrifice them to the gods, but the majority of the women decided otherwise. Apparently they thought that the presence of the unusual newcomers in the tribe would strengthen it and bring it success in hunting and in clashes with other tribes. So it was decided neither to release the prisoners nor to harm them, but to put them in a separate hut, in the middle of the village.

The tribe, who were then occupied in collecting berries and edible roots in the tundra for their winter stocks, were spending a few days in the same place. But then a heavy fall of snow obliged them to migrate about twenty-five miles to the south, where the taller trees would shelter them from the cold winds.

At first the prisoners suffered great hardship. They were given only raw meat, berries and roots to eat, and they had to sleep on crudely-dressed animal skins, which also served as protection against the cold. They could communicate with the savages only by signs and did not know what fate to expect. They could not escape for they were strictly guarded.

After migrating to a new place—a big clearing in a dense forest—the savages began cutting poles from slender trees, to make their huts. Dry boughs, bark, fragments of poles were lying about all over the place, and at the sight of them Igolkin remembered that he had a box of matches in his pocket. He collected some dry wood and made a fire. At the sight of the flames all the savages dropped their work and ran to look. They were astounded by this unprecedented phenomenon; when the fire burnt their hands it became an object of worship for them, and the strangers who were its masters inspired them with still

greater respect. From then onward the fire was kept constantly burning outside the prisoners' tent, and they roasted their portions of meat over it, on sticks.

Soon the prisoners learnt to understand the savages' language which was very simple. Their ideas were limited to hunting, eating and the primitive circumstances of their life, and their vocabulary consisted of one-and two-syllable words without declensions, verbs, adverbs or prepositions, so that their speech had to be supplemented with mimicry and gestures. They could count only up to 20, on their fingers and toes.

Each hut was inhabited by several women and men, joined in group marriage, along with the children of this group marriage, each child having one mother but several fathers. The men went hunting and manufactured bits of flint to serve as spear-heads, javelin-points, knives and scrapers. The women gathered berries and roots, dressed skins and took part in rounding up large animals when the forces of the entire tribe were needed.

They hunted all the animals that came their way and ate their innards as well as the rest of their flesh; they also ate worms, snails, caterpillars and beetles. The hunters ate the warm flesh and drank the blood of newly-killed beasts on the spot, taking what was left with the skins, home to the village. As to the large animals such as mammoths and rhinoceroses they surrounded and chased these into pits dug in the forest tracks and there finished them off with stones and spears.

They went hunting in family groups, or two or three families together, but when the quarry was a large animal that had to be surrounded, the whole tribe took part, with the exception of two or three women who were left to guard the prisoners. These women gave the breast to all the babies of the camp when their mothers were absent for a long time.

Misfortunes sometimes occurred. Predatory beasts and mammoths and rhinoceroses occasionally inflicted wounds and injuries on the hunters. The others then ate their dead and badly wounded companions.

This is how Borovoy described the general appearance of the savages: they had big heads with small, broad bodies and short, thick, powerful limbs. Their shoulders were broad and stooping, their heads and necks bent forward. Their short chins, massive brows and retreating foreheads made them resemble anthropoid apes. Their legs were a little bent at the knees. They walked

leaning forward, and squatted down on their haunches to eat and work.

From Borovoy and Igolkin's description, and from his examination of their weapons and chattels, Kashtanov concluded that this tribe had much in common with the Neanderthal men who lived in Europe in the mid-palaeolithic period, that is to say, in the Old Stone Age, and were contemporaries of the mammoths, long-haired rhinoceroses, primitive oxen and other animals of the glacial epoch.

These primitive men had only very crude stone tools, made of chips of flint: scrapers (for preparing animal skins), axes and knives, tips for spears and javelins that they used for hunting. They also fixed sharp fragments of flint into sockets in wooden cudgels, thus making them formidable weapons.

The savages called the fire made by their prisoners "the little sun", and worshipped it. They experienced the beneficent influence of the fire at the time of their main migration to the south, when the cold forced them from the forests. The hut-poles were too heavy to drag along with them, and it would have taken too long to cut new ones at each place where they stopped for the night, so during their migration they slept under the bushes in the woods, exposed to the severity of the cold winds. When they sat by their prisoners' fire they soon appreciated its warmth, and before long the whole tribe were sleeping near the fire at nights and zealously collecting fuel for it. But none of them took the step of making a fire of his own, and the prisoners refrained from suggesting this to them, wishing to remain the sole masters of the fire and enjoy the prestige this gave them in the eyes of the horde. They foresaw that, if they were not soon liberated, their position would become difficult.

The prisoners had counted the departing days of autumn with growing alarm, speculating how soon their comrades might return from the south and free them. Winter was gradually advancing from the north, and soon there would be a fresh migration still further away from the hill at the edge of the ice. It can be imagined, therefore, with what joy they heard the shots announcing the approach of liberation.

LIV

BACK AT THE TENT

THE explorers arrived back at their hill in the last week of December, and decided to take a holiday in celebration of the New Year, the success of the expedition to the south and the freeing of the prisoners. Supplies of food and fuel were adequate and for the time being there was no need to go off into the woods or the tundra.

They cleared a space, pitched the tent and dug a trench through the snow which was over three feet deep, leading to the store, the dogs' gallery and the meteorological cabin. Then they could relax. A little fire burned in the tent and it was warm and comfortable there. The six men passed the intervals between meals, walks and sleep, talking about their adventures and recalling various episodes from their journey to the south or their life with the horde.

Katu was a silent witness of these proceedings and was filled with ever greater respect for the white magicians who had so many strange things at their command. Her leg had started to heal, and she could already walk a little. They often found her squatting on her haunches beside the tent, gazing towards the south, where a dark strip of forest could be seen on the horizon. She obviously yearned to be back with her own people.

Igolkin tried to persuade Katu to stay and go back with them across the ice to the warm country where she would see all the wonders created by the white man. But she stubbornly shook her head, insisting:

"I, forest, mother's hut, meat, raw meat, hunting, happy!"

The explorers kept hoping that she would gradually get used to them and at last agree to leave with them. What a triumph it would be for the expedition to bring home a live specimen of primitive man!

When the frost grew more bitter she began shivering with cold, but rejected the clothes they offered her. When she went out of the warm tent into the air she wrapped herself up in her blanket only. She took no part in cleaning and tidying up the tent, washing the dishes, renewing the trenches through the

snow or fetching fuel. She asked Igolkin how many wives he had, whether they went hunting, whether the horde to which the white wizards belonged was a big one, and shook her head incredulously when they told her about the Europeans' way of life, about towns, seas, ships and so forth. Her only occupation in the intervals between meals and sleep was whittling sticks to make javelins and carving from the soft wood of willows collected for fuel very crude figures of mammoths, rhinoceroses, bears and tigers. She made herself a whole set of these idols, which she then worshipped, and was always asking Igolkin for blood to smear them with. But the explorers did not go hunting, and neither animals nor birds were to be seen in the tundra, so that her desire could not be satisfied.

In January they began making short trips in the sledges, so as to re-accustom the dogs to pulling in harness. The animals had already been won over and were now used to their former masters and living in the gallery dug in the ice under the hill—all except General, who stayed by the tent as watchdog. When the dogs had again become used to pulling in harness they began making longer trips across the tundra, to the edge of the forest to fetch fuel, as their stocks of this were running low. Five of the men would go on these expeditions, with three sledges, taking it in turns and leaving the other man in the tent to guard Katu. The girl always watched the departing men closely as they set off towards the forest and she could hardly wait for them to return; she hoped no doubt that they would encounter some animal and bring her back some fresh raw meat, for which she was pining. But her hopes were constantly disappointed, for they met no animals at all.

One day towards the end of January it was Papochkin's turn to remain on guard in the tent. After sitting for a couple of hours beside the fire after his comrades' departure, he dozed off from boredom and must have slept for quite a long time. When he woke up Katu was not in the tent. He rushed outside and saw, far off to the south, a black dot against the snow-white plain, getting further and further away. The captive had taken his skis, which she had learnt to use, and without them he could not pursue her across the deep snow. She had also taken her blanket, a lump out of a gammon of ham that had been hanging in the tent, a large knife, and a box of matches—she had learnt to use these.



The captive had taken his skis.

When they returned that evening Papochkin's comrades learned of Katu's flight and were extremely vexed by the news. Papochkin had to listen to no few reproaches for his idleness. But there could be no question of pursuing the fugitive. She had succeeded in getting too far away and they would have had to fit out a whole expedition to hunt her, with no certainty that they would catch her. Katu was travelling light and she was used when hunting to covering anything up to sixty miles a day; a sledge expedition could manage hardly half that distance in the time. There would be no sense, anyway, in trying to recapture the girl from her relatives, against her will.

Fortunately, they had photographed Katu several times before her escape—front-view, profile, back-view, and also taken her measurements in accordance with all the rules of anthropology, made a plaster mask of her face and impressions of her hands and feet.

They could not return across the ice before the end of March or the beginning of April, if they wanted to meet reasonably long days up above and reach the south coast of Nansen Land by the beginning of summer. There were nearly two months left before their departure. They decided to use this time for training both men and dogs in longer sledge journeys. During the last few days they had noticed at the edge of the forest fresh tracks left by deer—probably reindeer—musk-oxen and wolves. They concluded that at a day or two's walking distance from the tent they might count on finding game. Both the men and their dogs needed fresh meat badly. They were tired of eating ham, and there was, in any case, not much of it left, owing to Katu's voracity. They must keep the supply of ham for the journey and meantime obtain some game to keep them alive. They went off on hunting trips, three at a time, taking turns, with two sledges and the light tent, while the other three men and one dog-team stayed behind and rested from the previous journey.

CROSSING THE ICE

AT the end of March the explorers decided to start out on their return journey. They left the meteorological cabin where it stood, after depositing in it and in the storehouse under the hill, a soldered box containing a brief account of the expedition that had discovered Plutonia and the principal results of the journey to the south. For fear that the primitive men, who might visit the hill in the coming summer, should carry off the boxes or dismantle the cabin, they placed some of Katu's wooden idols on a shelf and scattered all the bones, empty tins and other rubbish on the floor as sacrificial offerings. It was Igolkin's idea; he had got to know the savages better than the scientist Borovoy had.

They dragged the sledges, loaded up with their specimens, food and chattels, across the snow-white tundra to the edge of the ice.

The return journey across Nansen Land lasted a whole month. The crossing of the chaos of ice, the long climb up Russian Ridge and the descent from it down the glacier, the persistent winds that blew in their faces, the overloaded sledges, the inadequate number of dogs—all these delayed them and demanded the exertion of all their strength. Frequent snowstorms also held them up, but on the other hand gave them and their dogs some extra hours of rest. Beyond the chaos of ice the succession of day and night, which the explorers had not experienced for so long, began again. They were unable to find some of the stores of food they had left *en route*, but at Cape Truhanov they found a fresh store with a year's stock of food, left by the *Pole Star*, and a message informing them that the ship was wintering about six miles to the east of the cape. From the top of Cape Truhanov they could see the ship in the distance, and halfway towards it they had a joyful meeting with their friends. Even Truhanov himself came, in a sledge drawn by young dogs, born on the *Pole Star* during its voyage. Greetings and questions were endless. Truhanov beamed when he heard that his suppositions about the interior of the earth had been brilliantly confirmed.

LVI

A SCIENTIFIC DISCUSSION

WITHIN a few days of the expedition's return to the *Pole Star* a very fierce blizzard, typical of the region, broke out and prevented them from walking or working in the fresh air. They whiled away their time in the wardroom, exchanging impressions of the winter in the ice and the journey into Plutonia. Truhanov was particularly interested in the details of their descent into the underground world, which had been accompanied by various phenomena incomprehensible to the expedition.

"And do you know, Nikolai Innokentyevich," said Kashtanov, "that your letter, which we opened the day we saw the mammoths in the tundra, though it explained where we were, didn't fully satisfy us. We would have liked to know what your theory, that the earth is hollow—which has been so splendidly confirmed—was based on."

"If you want to know," answered Truhanov, "that idea wasn't mine, and wasn't even new. Some Western European scientists put it forward more than a hundred years ago. I stumbled on it when I was looking through some old periodicals, got interested and set about checking it, and was convinced of its plausibility."

"Won't you share the evidence with us?"

"With pleasure. If you like, I'll give you a detailed account this evening." And that evening in the wardroom an interesting scientific discussion was held.

After briefly reviewing the notions of the ancient world about the earth being flat and surrounded by a primeval ocean, and Aristotle's theory that the earth was round, Truhanov dwelt in detail on the ideas of modern times.

"At the end of the eighteenth century the scientist Leslie affirmed that the interior of the earth was full of air, self-illuminated as a result of pressure. Two planets moved through this air—Proserpine and Pluto. . . ."

"Pluto?" Borovoy interrupted. "So we weren't being original in giving it that name?"

"No, the name had been thought of before," Truhanov went on. "And some scientists even worked out the orbits of these planets. When they approached the earth's crust this was supposed to cause magnetic storms and earthquakes. In Leslie's opinion, eternal spring reigned inside the earth, lit by a soft electric light, producing wonderful vegetation and a unique world. . . ."

"And he was quite right!" exclaimed Papochkin, in astonishment.

"The entrance to the earth's interior, in Leslie's view, must be sought near 82° North latitude. . . ."

"But this is simply amazing," said Maksheyev, clasping his hands. "How was he able to determine it so exactly? We found the southern edge of this entrance at 81° and a bit."

"Leslie located it by the place where the Northern Lights were strongest; he considered that these came from inside the earth and were the electric rays that illuminated the earth's interior. Leslie's views found many supporters, and an expedition into the interior of the earth was quite seriously discussed."

"Well now," said Gromeko, smiling. "Did we have precursors in that respect too?"

"No expeditions actually set out, because authoritative scientists of those days—Buffon, Leibniz, Kircher—ridiculed Leslie's hypothesis and called it fantastic. They upheld the conception that the kernel of the earth consisted of molten liquid—either in a single mass or with numerous secondary nuclei, which they called 'pyrofilations'. At the end of the eighteenth century the well-constructed hypothesis of Kant and Laplace, that our entire planetary system was formed from a gaseous incandescent cloud, conquered almost all minds and thrust all other theories into the background."

"But in 1816 Kormuls proved that the earth's interior is empty and its crust not more than three hundred miles thick."

"Halley, Franklin, Lichtenberg and Kormuls tried to explain the phenomena of terrestrial magnetism and the changes in it over the years from the point of view that the hypothetical internal planet actually existed. The German professor Steinhauser in 1817 considered the existence of this planet, which he called Minerva, almost beyond doubt.

"Projects were again put forward to send an expedition into the earth's interior. A retired infantry officer named Symmes,

living at Saint Louis in the State of Missouri, published a letter in the Press in 1818 and sent it to a number of institutions in America and Europe; the letter was addressed 'To All The World', and bore the motto: 'Light gives light to light discover *ad infinitum*.'

"This is what he wrote:

'I declare the earth is hollow and habitable within; containing a number of solid concentric spheres, one within the other, and that it is open at the poles 12 or 16 degrees. I pledge my life in support of this truth, and am ready to explore the hollow if the world will support and aid me in the undertaking. I have ready for the Press a treatise on the principles of matter, wherein I show proofs of the above positions, account for various phenomena, and disclose Dr. Darwin's "Golden Secret." My terms are the patronage of this and the new worlds. I dedicate to my wife and her ten children. I select Dr. S. L. Mitchell, Sir H. Davy and Baron Alexander von Humboldt as my protectors. I ask one hundred brave companions, well equipped, to start from Siberia in the fall season, with reindeer and sleighs, on the ice of the frozen sea. I engage we find a warm and rich land, stocked with thrifty vegetables and animals, if not men, on reaching one degree northward of latitude 82°; we will return in the succeeding spring.'

"Well, did this expedition take place?" asked Kashtanov.

"Unfortunately—or, if you prefer, to our good fortune—it did not. Symmes's letter attracted attention to himself and interested readers showered both the papers that published it and its author with many questions. The offer made by the daring captain, who was not afraid of leaving a widow and ten orphans, was discussed in the Press, but he got neither the band of a hundred brave companions nor the money for the expedition. The scientists whom Symmes had chosen as his patrons probably considered the poor fellow a visionary, or a lunatic. The point was that, though many people believed in the existence of a hollow inside the earth and the presence of a planet there, they did not believe in the existence of an opening by which one could penetrate within.

"Thus, the physicist Chladni, in an article about the interior of the earth prompted by Symmes's letter and published in a learned journal, said that such an opening could not possibly exist: if it had ever existed anywhere it must inevitably have

become filled with water. The extremely slow movement of the planet discovered by Steinhauser, Chladni explained by the fact that it takes place in a very dense medium of compressed air, perhaps under the influence of the attraction exercised by the sun and the moon. He also put forward two theses which are interesting, if not irrefutable; since air under strong pressure exudes heat and a strongly heated body must glow, in the centre of the earth's internal cavity, the tremendously compressed air must form a glowing and burning mass, something like a central sun.

"The inhabitants of the inside surface of the earth, if such there be, see this sun always at the zenith, and the whole inside surface lit up by it, which must make a very beautiful panorama.

"Hypotheses about an internal planet held sway for a certain period. In the 1830s Bertrand also supposed that the globe was hollow and that within this hollow there was a magnetic kernel which shifted, under the influence of comets, from one pole of the earth to the other.

"During the nineteenth century the hypothesis of a molten-liquid core of the earth, in accordance with the theory of Kant and Laplace, had the greatest number of supporters. These were divided only on the question of what was the thickness of the earth's hard crust; some found a crust of twenty-five to thirty miles sufficient, others worked it out to be sixty miles thick, and others again, considered it must be between eight hundred and fourteen hundred miles thick, i.e. it must be between a fifth and a third of the radius of the earth. But such a thickness is incompatible with the earth's volcanic and geothermic phenomena, as it is also with the hypothesis that supposes the earth to be a completely cooled, hard body. So the defenders of the thick crust theory accepted as a modification of it that within the crust there are a number of separate basins of molten matter which are also centres of volcanic action.

"In the second half of the nineteenth century a fourth hypothesis won more supporters; according to this, the earth has a hard, shallow crust and a hard core, with between them a more or less thick layer of molten rocks—what is known as the olivine zone.

"The hard core was presumed to exist because near the centre of the earth, owing to the enormous pressure prevailing there, all bodies, in spite of the high temperature must be in a solid state.

"The earth's crust consists of lighter rocks, and the heavier ones, rich in olivine and iron, are concentrated in the olivine zone; in the core itself the heaviest substances, such as metals, predominate. It is presumed that iron meteorites, which consist predominantly of nickel-iron, are fragments of the cores of planets, while stone meteorites, consisting of olivine and other minerals rich in iron, with a sprinkling of nickel-iron, give us some idea of the substances making up the olivine zone.

"This hypothesis has many adherents even today, but another one is fighting for priority—Zöppritz's hypothesis, which has revived in a new form the theory of Leslie and other scientists at the end of the eighteenth and beginning of the nineteenth centuries. This hypothesis proceeds from the physical law that in the high temperatures which must certainly exist in the bowels of the earth, all bodies must be in a gaseous state, in spite of the tremendous pressure that prevails.

"You know that there is what is called a critical temperature for gases, at which they are not compressed and do not become transformed into liquids whatever the temperature may be. Undoubtedly this critical temperature is surpassed several hundred per cent. at the centre of the earth. Therefore even the kernel itself must consist of what are called monoatomic gases, which have already lost their characteristic chemical properties, the molecules that constitute them having been split up into atoms under the influence of the high temperature. This kernel is surrounded by a layer of gas in super-critically heated state, and this in turn is surrounded by a layer of ordinary gas.

"Next comes a liquid layer composed of substances in a molten state, then a liquid layer of dense matter like lava or pitch, and then a layer that is transitional from liquid to solid, in what is called the latent plastic state, comparable in consistency with cobbler's wax.

"Finally, at the top we find the hard crust. None of the layers enumerated are, of course, separated sharply from each other, but are linked by gradual transitions, so that with the movement of the earth these layers cannot change places with each other, influencing the ebb and flow of the tides or the movement of the earth's axis. There are differences of opinion regarding the thickness of the earth's crust. The Swedish geophysicist Arrhenius thinks that the gaseous kernel occupies 95 per cent. of the earth's diameter, the molten liquid layers four per cent., and the hard

crust only one per cent., i.e. that it is about forty miles thick. Others allow the crust a more considerable strength—fifty, sixty or even six hundred miles. But a thinner crust, of forty to sixty miles, not more, agrees better with volcanic, mountain-forming, geothermic and other phenomena.

“As you see, this hypothesis has revived Leslie’s and other’s ideas—true, without internal planets or external orifices—and has even confirmed Captain Symmes’s opinion about the concentric spheres. But of course there could be no question of inhabitants of the earth’s interior if the temperature were such as even to decompose gases into their atoms.”

“Yet it is inhabited!” exclaimed Kashtanov. “When you sent the expedition there, did you expect that it would be found to be inhabited?”

“I thought it quite possible; and now I’m going on to expound my own theory,” Truhanov answered. “I’ve long been a supporter of Zöppritz’s hypothesis and have carried out observations and calculations to develop it further and find confirmation of it. My observations were concerned with determining the force of gravity, with the phenomena of geomagnetism and with the distribution of earthquakes.

“As you know, seismic waves spread not only laterally through the hard crust of the earth but also directly across through the bowels of the earth. Therefore, if an earthquake occurs in our antipodes, sensitive instruments register two sets of impacts—first those that have come by the shortest route, the earth’s diameter, and then those that have spread through the earth’s crust, that is, round the circumference of the globe. The speed with which the tremors spread depends on the density and homogeneity of the medium, and so this speed enables us to judge of the state of the medium.

“There have been a number of observations carried out at various seismic stations around the world, and in particular at my observatory at Munku-Sardyk, where I set up some new, extremely accurate and sensitive instruments in a deep mineshaft at the foot of a chain of mountains; these observations have revealed facts that do not square with Zöppritz’s theory. They have proved that the core of the earth cannot consist of gases strongly compressed by pressure; on the contrary, it is composed of rarefied gases, only a little denser than our air, and occupying three-quarters of the diameter. In other words, this gaseous core

must be approximately five thousand miles across, so that there is only fifteen hundred miles of thickness on either side left for the liquid and solid layers. And in the middle of the gaseous core one must admit the existence of a solid or nearly solid body, that is, an internal planet, with a diameter of about three hundred miles."

"How were you able to determine the diameter of this invisible body?" Borovoy wanted to know.

"Very simply. This body stood in the way of the shock-waves only of those earthquakes which occurred at the direct antipodes of my observatory, that is, in the Pacific Ocean, to the East of New Zealand; if the earthquake occurred in New Zealand itself, or in Patagonia, the solid body was not on the direct route of its diffusion. A number of observations enabled me to determine the maximum size of this body—only approximately, of course.

"So, then, these observations showed that inside the earth there is a large space filled with gases not much different in density from air, and in the midst of this is an internal planet of diameter not greatly exceeding three hundred miles. Altogether, these observations proved more compatible with the hypotheses of earlier scientists than with Zöppritz's theory. But, this being so, doubt arises as to the correctness of all the calculations regarding the distribution of heavy substances in the earth's crust. The average density of the earth, as you know, is 5.5, and the density of the rocks in the surface strata of the crust is only 2.6 to 3.5 or even less, if you take into account the great masses of water in the oceans. Scientists consider, therefore, that on the way towards that centre there must lie substances of greater and greater density, reaching 10 to 11 at the centre of the kernel. But if inside the earth there is a large space filled with gas having the density of air, with a little planet in the midst of it, then we must acknowledge a completely different distribution of density in the earth's crust surrounding the inner cavity of gas. I consider that the light, superficial part of the crust is about fifty miles thick, the heavy inner part with a big content of heavy metals is about 1,450 miles thick, and the inmost cavity, filled with gas is about 2,500 miles across to the centre, including the planet; that adds up to 4,000 miles, approximately the radius of the earth. If you take the average density of the heavy part of the crust as being 7.8, the density of the earth as a whole comes to 5.5, in accordance with the geophysicists' calculations."

On the wardroom blackboard, Truhanov worked out before his audience all his calculations as to the size and weight of the constituent strata of the earth, in order to prove the distribution of masses which he had suggested. Having adopted the hypothesis of Zöppritz in this changed form, Truhanov examined the question of how the aperture had been formed that linked the earth's surface with the internal cavity—the aperture by which condensed and burnt gases would escape from the cavity. Mentioning the frequent falling to earth out of cosmic space of the heavenly bodies called meteorites, Truhanov put forward the following supposition: at some time a huge meteorite must have fallen upon the earth, burst through the 1,500 miles of crust, and remained inside, transformed into the planet Pluto. As evidence of the possibility of such a fall he pointed to the enormous hollow called the Meteor Crater in the North American State of Arizona, which is the dent made at some time by an enormous meteorite, to judge by the fragments that are found all over this hollow. This meteorite, however, did not manage to penetrate the crust, it bounced off and probably fell into the Pacific Ocean, whereas Pluto broke through and remained inside.

“When did this occur?” asked his listeners.

“Not later than the jurassic period, to judge by the fact that in the remotest part of the inner cavity reached by the expedition you found representatives of jurassic fauna and flora; these migrated into the cavity from the earth's surface after the formation of the aperture, with the escape of gas and the cooling of the inner cavity. Later on there the fauna and flora of the cretaceous, tertiary and quaternary periods gradually migrated thither, successively pushing the intruders of the preceding period farther and farther into the depths of the cavity.

“While Nansen Land remains icebound, the inner cavity is guaranteed against penetration from the earth's surface by present-day flora and fauna. Only twentieth-century man, in your persons, has boldly overcome this obstacle and penetrated into the mysterious land where, thanks to a constant climate and conditions of life, representatives of long extinct flora and fauna have been miraculously preserved. You have opened up this palaeontological museum, the existence of which I did not even suspect.”

“You've given a brilliant explanation of how the internal surface of the earth came to be peopled,” Kashtanov observed, “though

paleontologists may not all agree with everything you've said. But I still want to ask what became of the fragments of the earth's crust that must have been broken off when the hole was made?"

"I think that the smaller fragments were ejected by the gases that burst out from the bowels of the earth, while the bigger ones may partly have fused with the meteorite to form the glowing body Pluto and may partly have fallen on to the inner surface, forming hills and plateaux there.

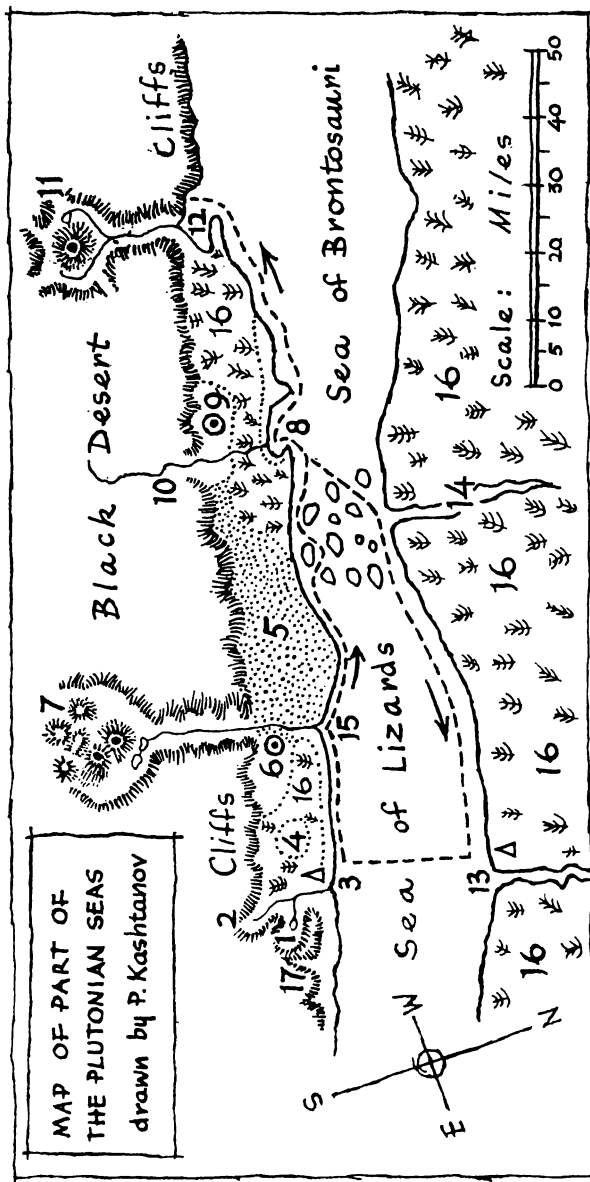
"Perhaps the big hills of olivine rock, rich in iron, which you discovered on the middle course of the Maksheyev River are such fragments. Perhaps the entire plateau of black desert on the southern shore of the Sea of Lizards consists of a huge fragment of this kind. All this calls for further study."

"And the volcanoes, extinct and active, which we found on that plateau—how do you explain their existence?"

"That's not difficult, I think. According to Zöppritz's hypothesis, there is a molten liquid stratum above the gaseous zones. After the hole was made, when the gases had rushed out through it and the pressure inside the earth had begun to fall sharply, part of this stratum must have been transformed into steam and gas, and the rest into a boiling, fiery sea. The steam and gas gradually escaped through the aperture, the temperature and pressure of the inner cavity grew less and less, and the sea of lava began to be covered with a hard crust. At first the latter was thin and weak, often breaking under the pressure of the gas and steam which continued to be given off by the molten mass. But gradually it became stronger, breaches in it grew less and less frequent—just as happened on the surface of the earth in the first period of its existence. All that the volcanoes show is that at a certain depth below this crust there are still basins of molten lava which cause eruptions, as on the earth's surface, with this difference, that the products of these eruptions are very heavy rocks, saturated with iron, unlike anything we find on earth."

"But if the inner surface was originally a sea of fire, as you said," remarked Maksheyev, "the fragments of the crust that fell into it must have been drowned or melted in it."

"Not necessarily," Kashtanov rejoined. "Small fragments, of course, would have been melted, but large ones, thanks to their size—and they may have been several miles in diameter—



1. Lake of the Stegosaurus. 2. Ravine of the Pterodactyls. 3. Landing Place. 4. Clearing of the Iguanodons. 5. Sand Dunes. 6. Anthill No. 1. 7. Satan Volcano. 8. Bay of Fish. 9. Anthill No. 2. 10. Ants' River. 11. Grumbler Volcano, Hermit's Lake and River Papochkin. 12. Bay of Sanctuary. 13. Mouth of River Maksheyeve. 14. River Gromeko. 15. Mouth of Sulphur River. 16. Forest of Horse-tails, Ferns and Palms. 17. Ravine of the Milliards.

would have been melted only in part. As regards their sinking into the depths of the fiery sea, that would have depended on their specific gravity. If they were lighter than the molten mass—which may quite possibly have been the case with some of the fragments—they would have floated on its surface, like icefloes on the sea, and, like icefloes, would have melted at the edges and on the underside.”

“I don’t insist on my idea,” declared Truhanov. “It was simply the first suggestion that came into my head when you asked your question. All this requires further research. We only know a narrow strip of Plutonia along the banks of the Makshe-
yev River and the shores of the Sea of Lizards, but what is the vast territory like on either side of the river? Does the black desert extend far to the south? What lies beyond this desert? Are there any more oases of life?”

“I think not,” said Papochkin, “and I’ll tell you why. The winds that blow from the north, through the aperture, bring the moisture indispensable to life. This moisture is mainly a product of the earth’s surface. As we found, there is no rain much beyond the southern shore of the Sea of Lizards. The winds leave all their moisture on this surface comparatively near the aperture, and beyond the sea, the entire remaining expanse of the inner surface is a barren desert of congealed lava. I think that, in the beginning, the jurassic forms of life remained very near to the aperture; these forms of life advanced southward only gradually, as the amount of moisture in the form of rivers and lakes increased, thanks to the constant inflow through the aperture. Perhaps the Sea of Lizards was formed comparatively recently, and that is why it is not so salt as the ocean.”

“Well, I can’t agree with that,” said Kashtanov. “If this sea had been formed recently it would not contain representatives of jurassic fauna such as fish, ichthyosauri and plesiosauri. Neither fish nor ichthyosauri could have migrated from the earth’s surface across dry land, like the ants, or through the air, like the pterodactyls. That means that the sea did penetrate into the hole, even though not for a very long time, and only in a narrow tongue.”

“But, excuse me!” cried Papochkin. “How could the sea have broken in after the meteorite? It would have encountered the incandescent gases and the fiery surface, and all the saurians and fishes would have been turned into a colossal fish-soup, and left no posterity behind them.”

Everyone laughed, but Kashtanov replied:

"You are drawing too hasty conclusions from my words, Semyon Semyonovich. I did not say that the sea entered in the wake of the meteorite. That fell, as Nikolai Innokentyevich has suggested, in the triassic period, whereas the fauna in the sea are jurassic. Consequently we have a sufficient interval of time for the exit of the gases and the cooling of the interior surface to have taken place. Perhaps in another part of Plutonia the Sea of Lizards may extend a good deal farther to the north, and form the route by which the marine fauna migrated into the interior."

"There, you see how many extremely interesting and important problems arise as soon as we begin to discuss the natural phenomena of Plutonia," said Truhanov. "And each one of us can find a whole series of them in his own special field. But the outcome of it all will be that we shall have to send a second expedition to investigate Plutonia further—don't you agree?"

EPILOGUE

MAY came and went, but did not bring the long-desired spring. Though the sun no longer sank below the horizon, only dipping a little to the north and rising to the south, it gave little warmth, and the snow melted only on the vessel's south side and on the steep cliffs of the shore. Moreover, sunny days were often succeeded by dull ones; a wind blew up, snow whirled above their heads, often a real blizzard burst upon them and it seemed that winter had returned. This fresh snow continually delayed the melting of the old which had already settled and was ready to thaw at the arrival of the first warm day. It was not until the first half of June that they welcomed the spring they had waited for so long.

Innumerable streams flowed over the cliffs, tiny flowers appeared in the little cleared patches and blossomed before their eyes; water insects, sprung from heaven knows where, swarmed in puddles heated by the sun's rays. But the sea, thickly covered with ice, still slept. However, on calm days they could from the masthead make out a dark strip of clear water, far away to the south.

"Spring is late here this year," the Captain remarked to the explorers who now had to spend most of the day on deck owing to the water covering the ice almost everywhere.

"Yes, at this time last year we had already sailed to this shore."

"That was because strong winds were stirring up the sea and breaking the ice, whereas there have been ten days of calm, or with just a gentle south wind."

"Shall we have to spend another winter here, if the sea doesn't open?" asked Papochkin, who was getting bored.

"Oh no! In July, or at the very latest, in August, the sea will clear, even if there's no wind."

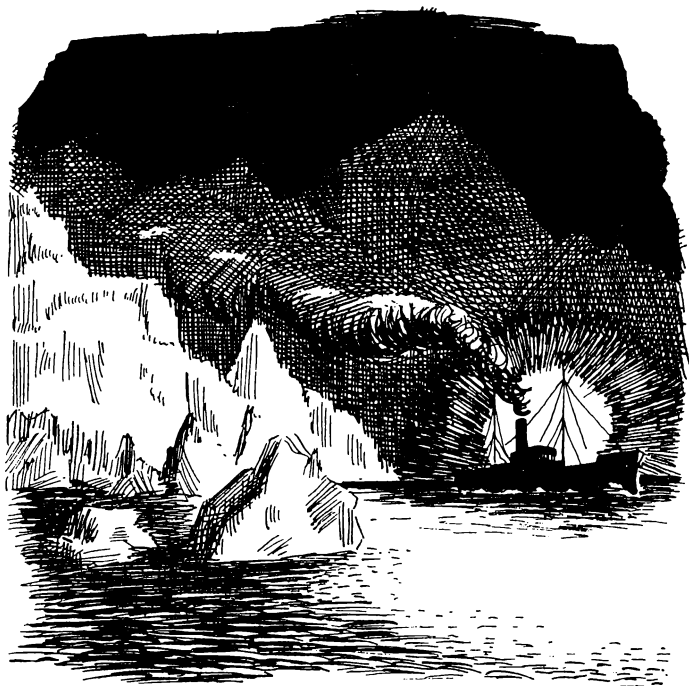
"In July or August!" cried Gromeko and Maksheyev together. "Are we going to have to spend half the summer here?"

"Yes, you have to reckon with that possibility, on Arctic voyages. In bad years there's only one month, or one and a

half, available for navigation; in good years, two or three."

The patience of the men on the *Pole Star* was indeed put to the test. June was calm, but its second half was dull and cold. At nights there was frost, sometimes snow fell, and it seemed that the summer had already come to an end.

At last, at the beginning of July, a storm that blew from the south, though it brought more snow did break up the ice, and



The ship fired a salute of farewell and set out southward.

the ship, which had already been scraped clear and was ready to sail, fired a salute of farewell to gloomy Nansen Land and set out southward.

The weather, however, continued dull and damp, and rain or snow often fell. Sometimes mists obliged them to halt for hours at a time.

It was only at the beginning of August that the *Pole Star* emerged from captivity and passed at full speed through the

Bering Strait. All breathed freely at last. In two or three weeks they would be at Vladivostok.

In mid-August they were sailing in the latitude of the Kamchatka River; the shore of the peninsula, the cones of the volcanoes, including the smoking Klyuchi Volcano, could be seen in the distance. The day was unusually serene and the stormy Bering Sea lay calm as a mirror, right up to the horizon. Thanks to the transparency of the autumn air they could just see the peaks of Bering Island, away to the south-east, the nearest of the Commander group of islands. A large vessel was approaching at full speed from that direction, as though heading for Nizhne-Kamchatsk.

"It's probably a Russian cruiser patrolling these waters," said Maksheyev, in answer to the queries of his companions, who were assembled on the deck in a very cheerful mood owing to the calm sea and the good progress they were making.

"Whom do they watch for?" Kashtanov wanted to know.

"Pirates—American and Japanese. The Commander Islands are known to be the best, if not the only, sanctuary of the valuable marine seal, whose numbers have been rapidly reduced through ruthless extermination. So our Government only allows seal-hunting at a certain season of the year, with restriction as regards the females and the young. But greedy hunters try to get round the prohibition. That's why the islands are often visited by our naval ships, which have the right to stop any suspicious craft sailing in these waters.

"I believe she's got her eye on us!" exclaimed Truhanov. "The cruiser is heading straight this way."

And indeed, the cruiser, a large, three-masted vessel, was moving at full speed to intercept the *Pole Star*. They could already make out the gleaming muzzles of her guns and a knot of men standing on the bridge. Suddenly, from one of the guns a cloud of smoke burst forth, and the roar of gunfire was heard, while at the same moment the signal broke from the cruiser's mast: "Heave to or I fire."

The *Pole Star* obediently stopped its engines. According to the custom of the sea, the captain, as soon as he had noticed the cruiser, had ordered the Russian flag to be run up. But the cruiser had not followed this example.

The passengers crowded to the side of the ship, gazing at the handsome vessel that was rapidly drawing nearer.

"What's this? It's not a Russian cruiser at all; it's called *Ferdinand*, and the name is written in Latin characters," exclaimed the captain as he peered through his telescope.

"What right has she to stop a Russian ship in Russian waters?" demanded Kashtanov.

"What's the nationality of this *Ferdinand*? German, I suppose?"

"We'll soon find out," answered the Captain, looking into his pocket naval calendar.

"Ah, I've found her. *Ferdinand*, cruiser of the Austro-Hungarian navy, built in 1909, so many tons displacement, ten guns of such-and-such calibre, crew of 250, speed so much . . ."

By then the cruiser had come quite close, slowed down and halted a cable's length from the *Pole Star*. A boat was lowered from her side, and they saw two officers and some twenty sailors, armed with rifles, descend the ship's ladder into this boat. It headed for the *Pole Star*, whose passengers, with her captain and entire crew, gathered at the rail in complete bewilderment. But they had, willy-nilly, to let down the ladder for their uninvited guests.

The two officers and ten of the sailors stepped on deck.

"This is a Russian vessel?" asked the senior of the visitors, raising his right hand to the peak of his cap.

"Yes, Russian. The yacht *Pole Star*, privately owned," answered Truhanov.

"Are you the captain?"

"No, I'm the owner."

"Is it a merchant vessel or a whaler?"

"Neither. The *Pole Star* is bringing a scientific expedition back from a voyage in the Arctic Ocean. But I should like to know what grounds you have for stopping a Russian vessel in Russian waters and subjecting us to an interrogation?"

"The grounds provided by naval law and the state of war."

"What's that? What state of war? What's going on?" the passengers asked, now extremely alarmed.

The officer smiled.

"You don't know, then? You've been away a long time, voyaging in the Arctic Ocean?"

"Since the spring of last year."

"*Diese Russen sind wie vom Himmel gefallen* (It's as though these Russians had fallen from heaven)", said the Austrian, turning to his companion, who evidently did not understand Russian very well. He smiled and asked:

"*Sie wissen gar nichts vom Kriege?*" (Do they know nothing about the war?)"

Then the senior officer went on:

"I must tell you that the Austro-Hungarian Empire and the German Empire have been at war with Russia for a year, and we, cruiser of the Imperial Navy *Ferdinand*, are going to seize your ship as a prize of war. Do you understand?"

"But my ship is not a warship—it's a peaceful, scientific, vessel. Private ships are never confiscated."

"A peaceful vessel, eh? And what's this?" The Austrian pointed to the little gun in the bows, used for giving signals and firing salutes. "That's a weapon!"

Truhanov only smiled.

"Every peaceful vessel," the Austrian went on, "can be armed, can serve to make landings, carry war cargo or war communications. No, it can't be helped—peaceful vessels must be seized."

"May I speak to the officer commanding the cruiser?"

"Do you speak German?"

"No, but I speak French and English."

"Good. Let's go across to the cruiser then."

The officer said something in an undertone to his companion and then climbed down the ladder and into the boat, with Truhanov, and returned to the cruiser. The second of the two officers, with the armed sailors, remained on the *Pole Star*.

Kashtanov, who spoke German well, entered into conversation with the officer, who readily answered his questions and informed the passengers of the main events that in July, 1914, had led up to the European War; and the time passed quickly until Truhanov came back, accompanied by two officers and some more armed sailors.

"We are to be put ashore on the coast of Kamchatka," he said. "We must go to our cabins and pack while the *Pole Star* is escorted to the shore. They are confiscating it unconditionally, with all its cargo."

In the cabin, with the Austrians out of the way—they remained on deck to take over the vessel—Truhanov told his companions:

"The commander of the cruiser took the same line with me as the other officer had done. At first, after consulting with his second-in-command, he wanted to carry us off as prisoners. I can speak and understand German quite well," Truhanov

explained, "but I purposely concealed the fact, so as to learn what they would say to each other about their intentions. I learnt that they haven't much food and count on just being able to manage with our stores. So they don't want any extra mouths to feed, in the shape of prisoners. One of the officers insisted that they ought to take at least those of us who are under forty-five—that is, all except me—as liable for military service; but the commander reassured him by saying that before we had returned to Moscow the war would probably have ended with the defeat of Russia and France.

"And so," Truhanov went on, "they decided to put us all ashore, but to let us take only our essential clothing, a few provisions and personal cash. They are confiscating the expedition's funds, and everything else."

"What, with all our specimens, all the results of the expedition?" cried Papochkin indignantly.

"Yes, everything, unconditionally! Our diaries, of course, we can hide in our pockets, but the photographs, skulls, skins, herbaria and so on must be left behind. They promise that all of it will be sent safely to Vienna and will be given back to us when the war's over."

"Provided that they aren't sent to the bottom by some French or Russian submarine or mine on the way," observed Borovoy angrily.

"That's quite possible," Truhanov went on, "especially as England's in the war, too. . . ."

"In short, they're looting everything we've got, just as the ants looted us," said Maksheyev with a wry grin.

"There's some possibility that we may get our things back," said Truhanov.

"From their hints I inferred that they have a base somewhere near here, most likely in the Commander Islands, from where the cruiser came out to us. They'll take the *Pole Star* there. When we get back to Vladivostok we'll tell our naval authorities and they'll deal with that base."

"Well, we'll get to Vladivostok sometime!"

"Anyway, it's our only hope. Now we must pack."

They all dispersed to their cabins. The *Pole Star* was already making for Kamchatka at full speed, escorted by the cruiser. They were heading for Ust-Kamchatsk, the first inhabited place on the coast north of Petropavlovsk. Soon the crestfallen

passengers gathered on deck with their bags and bundles, which the Austrians inspected in an easy-going way, without rummaging in them or looking in their pockets. Thus Maksheyev escaped losing his gold, which he had put into a broad leather belt of the kind worn by gold-prospectors, in the form of a long narrow bag. As he was carrying a whole pood¹ of it, he moved very clumsily. But the sausage stuffed with gold round his waist was hidden under his shapeless fur coat and the Austrians paid no attention to his awkward gait. The specimens and all the expedition's property, which had long since been packed up in boxes ready to be transported by rail, were handed over with an inventory to the Austrians; the latter were of course not told where the expedition had actually been.

"We went to Chukotka, and wintered on Wrangel Island," Truhanov told the officer who took over the expedition's belongings. The Austrian nodded sympathetically and said:

"My father was in the Polar expedition that went to Franz Josef Land—the Austrian corvette *Tegetthof*, you must have read about it?"

"Oh, yes!" smiled Truhanov.

Towards evening both vessels hove to near a long spit of land at the mouth of the Kamchatka River, behind which was a small fishing village. The passengers and their luggage were taken off in three boats and rowed to the shore. Igolkin and the captain set out at once to the village to find means of transport. The rest stood on the shore sadly watching as the boats were hauled on board again and both vessels put out to sea at full speed. While it was still twilight, even before their comrades returned with the only horse of the village, the ships had disappeared in the evening haze.

The travellers had to spend ten days at Ust-Kamchatsk owing to lack of transport. The scanty population living along the Kamchatka River were intensely busy with their fishing because the autumn migration of fish had begun and nobody, naturally, had any desire to abandon his fishing, which provided food for men and dogs for the whole winter, in order to take a lot of passengers in hollowed-out canoes up the river. Only Igolkin, who was in a hurry to see his wife at Petropavlovsk, went that way, taking General with him, and bearing a letter to the Governor. In this letter Truhanov reported the confiscation of

¹ 36 lb. (Trans.)

the *Pole Star* and the existence of an enemy base in the Commander Islands, and asked for help.

At the end of August a Japanese fishing vessel called at Ust-Kamchatsk and agreed, for a large fee, to transport them all to Japan. To make room for the passengers it had to leave part of its cargo.

This voyage, which lasted three weeks, was far from being a pleasant one. Some of them were accommodated on deck and the others in the hold, among barrels of fish. They lived on Japanese food—fish, rice and tea—and suffered from severe pitching and tossing, fog, rain and snow. As they were sailing along past the Kurile Islands they were nearly shipwrecked on the reefs during a storm; when they got to Patience Bay the Japanese wanted to disembark the party there on the pretext that Japanese Sakhalin was the same as Japan, and agreed to take them further only after an extra payment.

At Wakkanai, at the northern end of Hokkaido, the northernmost of the islands of Japan, the exhausted passengers left the boat by their own choice, since from there they could get to the port of Hakodate quicker and more comfortably by rail.

From Hakodate, at the southern end of the island and almost in the same latitude as Vladivostok, communication with the latter was frequent and regular. After a number of interrogations and formalities due to the fact that Japan had joined in the war, on the side of the Entente, a mail boat took the whole party to Vladivostok.

Great was the astonishment of the explorers when, on approaching the landing-stage, they saw the *Pole Star* among the vessels in the roadstead, with a sentry standing on deck. They quickly made inquiries, and discovered that when the Governor of Kamchatka received Truhanov's letter he had radioed Vladivostok, as he had at his disposal no vessels large enough to take on the Austrian warship. A fast cruiser sent from there had found the *Pole Star* near the Commander Islands, but the Austrian ship had managed to get away in time.

The port commandant, who gave them this information, then proceeded to disappoint our friends, who were already hoping to recover their specimens. The *Pole Star* had been picked clean by the Austrians—specimens, equipment, supplies, even the cabin fittings and valuable parts of the engines had been removed, so that the vessel had had to be towed into harbour.

It could not sail again without extensive repairs; and Truhanov agreed to the proposal of the naval authorities that he hand it over to them for the duration of the war, for service as an auxiliary vessel.

The despondent explorers were sitting in the Trans-Siberian express, on their way home. After discussing the position, they decided that until the end of the war, which everyone expected would come soon, and until they had recovered their specimens and photographs, they must say nothing about the expedition to Plutonia. How could they prove, apart from mere words, that Plutonia and its wonders existed and that it was possible to enter it? Every man in his right mind would regard their story as utter fantasy, and they themselves as either liars or lunatics.

But the war dragged on, and after it came the revolution and other events. . . .

Ten years elapsed, the members of the expedition were scattered; some had been killed at the fronts, others had died. Nobody knew what had become of the specimens and documents. Truhanov, who had returned to his observatory on Munku-Sardyk and was living there like a hermit, had lost all hope of getting them back.

The author chanced to come upon the diary and sketches of one of the members of the expedition now dead. From that information he compiled this book.

PLUTONIA

V.A. OBRUCHEV